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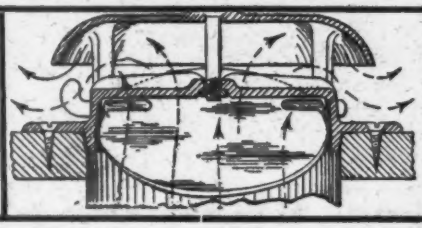

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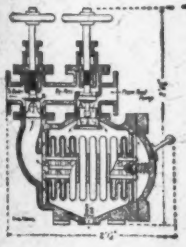

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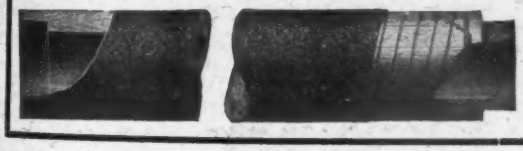

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK OCTOBER, 1911

Ten Formulas for Figuring Radiation

An investigation set on foot by the National District Heating Association to learn the various methods in use by central station engineers for figuring both steam and hot water radiation has brought forth some unique rules which are as diversified as they are interesting. The formulas are here published for the first time, being included in a manuscript report of the association's committee on radiation.

In commenting on the formulas received, the chairman of the committee, W. K. Martin, of Crawfordsville, Ind., states that the methods of arriving at the necessary amount of radiation required to heat a building and maintain a certain temperature with a certain outside temperature and weather conditions fluctuating seem to be many and of different varieties, as he failed to find any two heating engineers or any two operating companies who use the same formula in arriving at a conclusion.

In applying the formulas here presented to a typical building requiring approximately 400 sq. ft. of radiation for steam and 700 sq. ft. for hot water, it was found that the estimates varied as much as 219 sq. ft. for steam and 120 sq. ft. for water. Each estimate, of course, was made for the same outside temperature and weather conditions.

Formula No. 1

For steam:

$$R = \frac{(C \times a) + (W \times b) + (G \times d)}{250}$$

For water:

$$R = \frac{(C \times a) + (W \times b) + (G \times d)}{160}$$

Where R = radiation.
C = cubic contents.
W = exposed wall.
G = glass (doors and windows).
a = cubic contents factor.
b = wall factor.
d = glass factor.

Factors:
For cubic contents, 1.4.
For exposed wall, 9-in., 24.
13-in., 21.
18-in., 17.
frame, 50.
best frame, 25.
For glass, plate, 40.
double, 60.
single, 80.

Formula No. 2

For hot water:

$$R = d75 \left\{ \frac{W - G}{h} + G \right\} + C$$

For steam: Divide result by 1.6.
Where R = radiation.
W = exposed wall.

G = glass (doors and windows).
C = cubic contents.
h = wall constant.
For 4-in. brick, 4.
For 9-in. brick, 5.
For 13-in. brick, 6.
For 17-in. brick, 7.
For 21-in. brick, 8.
For frame, 5.
d = temperature constant.
For 50° = 0.005.
For 60° = 0.007.
For 70° = 0.0082.
For 76° = 0.009.

For 10° F. below zero, add 10%.

Living rooms and reception halls to be maintained at 70° F.
Sleeping rooms, at 60° F.
Kitchens, at 60° F.
Bath rooms, at 75° F.

Formula No. 3

For hot water:

$$R = (0.005\,V + 0.05\,W + 0.5\,G)\ 1.87$$

For steam:

$$R = 0.005\,V + 0.05\,W + 0.5\,G$$

Where R = radiation.
V = cubic contents.
W = exposed wall.
G = glass (doors and windows).

Factors:
For cubic contents, 0.005.
For exposed wall, 0.05.
For glass, 0.5.

Formula No. 4

For steam:

$$R = G + (W + A) \times 75 + C \times B$$

Where R = radiation.
C = cubic contents.
W = exposed wall.
G = glass (doors and windows).

Factors for A:
8-in. brick wall, 8.
12-in. brick wall, 10.
16-in. brick wall, 12.
20-in. brick wall, 15.

Factors for B:
Steam at 2 lbs. gauge, 0.0055.
Water at 170° F. at radiator, 0.008.
Add 10% for 10° F. below zero.

Formula No. 5

For steam:

$$R = \frac{\left\{G + \frac{W}{4} + \frac{C}{55} \times 2\right\} \times d}{250}$$

Where R = radiation.
C = cubic contents.
W = exposed wall.
G = glass (doors and windows).
D = difference between inside and outside temperatures.

Factors:
For cubic contents, 0.04.
For exposed wall, 0.25.
For glass, Net.

Formula No. 6

For hot water:

$$R = \left\{\frac{E}{T} + C\right\} \times 75 + C + 100$$

Where R = radiation.
E = exposed wall.
G = glass and doors.
C = cubic contents.
T = ratio.
75 = constant.

Ratio for 9-in. brick wall, 8
13-in. brick wall, 10.
18-in. brick wall, 12.
Frame, 8

Formula No. 7

For steam at 2 lbs. gauge at service valve:

$$R = C + \left\{G + \frac{W - G}{F} \times 75\right\} \times 0.0055$$

Where R = radiation.
C = cubic contents.
W = exposed wall.
G = glass.
F = factor.

Factors:
For 9-in. brick wall, 10.
For 13-in. brick wall, 12.
For 18-in. brick wall, 15.
For frame, same as brick.
For plate glass, double and single glass, net.

Add 1% for each degree below zero.

Formula No. 8

$R = (C \times F) + (W \times F) + (G \times F)$

Where R = radiation.
C = cubic contents.
G = glass (doors and windows).
W = exposed wall.
F = factor.

Factors for steam:

For cubic contents,	0.006.
For exposed wall,	0.09.
For glass,	0.45.

Factors for hot water:

For cubic contents,	0.0085.
For exposed wall,	0.125.
For glass,	0.64.

Formula No. 9

For hot water:

$R = C \times 0.0073 + (W - G \times F) + (G \times F)$

Water entering the building at 180° F. for zero outside.

Where R = radiation.
C = cubic contents.
W = exposed wall.
G = glass (doors and windows).
F = factor.

Factors:

For cubic contents,	0.0073.
For 9-in. brick wall,	0.12.
For 12-in. brick wall,	0.10.
For 18-in. brick wall,	0.10.
For frame construction,	0.14.
For plate glass,	0.5.
For double glass,	0.7.
For single glass,	0.7.

Formula No. 10

$$R = 0.3\left\{\frac{C}{55} + G + \frac{W}{4} + \frac{B}{20} + \frac{A}{20} + \frac{O}{2} + \frac{I}{3}\right\}$$

Where R = radiation.
C = cubic contents.
G = glass.
W = exposed wall.
B = basement ceiling.
A = attic floor.
O = outside doors.
I = inside doors.

Factors: For cubic contents, 0.019 B. T. U. per cubic foot per degree difference in temperature per hour. Air change, one per hour.

Factors for walls and glass in B. T. U. per square foot per degree difference in temperature per hour:

For 9-in. brick wall,	0.44.
For 13-in. brick wall,	0.3.
For 18-in. brick wall,	0.24.
For frame construction,	0.25.
For plate glass,	0.75.
For double glass,	0.90.
For single glass,	1.03.

Additional data are being gathered by the association in an endeavor to compile a standard formula or set of formulas applicable to varying conditions.

Heating and Ventilating Equipment of the City Investing Building, New York

BY J. BYERS HOLBROOK

A comprehensive idea of the mechanical equipment required in a large office structure like the City Investing Building is to be had from the description of this plant prepared by one of the designing engineers and read at the recent meeting of the National District Heating Association.

As an office building, pure and simple, this structure Mr. Holbrook states is probably the largest of its kind in existence. It is located on the south side of Cortlandt street, between Broadway and Church street, New York, and grossly bulks up to approximately 10,250,000 cu. ft. of space. The main portion of the building is carried twenty-six stories, the tower or middle part being carried thirty-three stories, a total height above sidewalk of 470 feet.

The building is equipped with its own light and power plant, is heated on the two-pipe up-feed vacuum return system, has complete mechani-

cal exhaust ventilation for all toilet rooms throughout, a vacuum sweeper plant, motor generator service for office annunciators, etc., and contains generally all up-to-date devices which go to make up the ideal office building equipment.

The building is equipped with twenty-one standard plunger elevators. In compliance with the usual practice, the general power plant is located in the sub-basement. The total coal storage approximates 800 tons.

The boiler plant consists of four 400 H. P. and one 350 H. P. Babcock & Wilcox water tubular high pressure boilers, aggregating in all 1950 B. H. P. The coal (Buckwheat No. 2) is hand-fired and is burned by means of natural draft, furnished by a stack approximately 500 ft. high, continuing roughly 50 sq. ft. of net area. This stack is probably the highest stack in existence and not only handles the gases from its own plant, but also from the boiler plant of the Singer building immediately adjoining on the south. The Singer stack is carried up only fourteen stories, and to overcome the smoke, furnace gases, etc., wafted toward the City Investing Building, it was arranged by the various interests to make this connection. The possibility of such a future smoke connection was taken into account by the engineers and for this reason the City Investing stack was designed liberally for the additional load.

PUMPS

Two house pumps, each 14 x 20 x 10½ x 18, with a capacity of handling 1000 gallons per minute, are installed, beside one fire pump of a similar capacity. In addition to the elevator pumps, there are three boiler feed pumps installed, two 12 x 7½ x 10 and one 10 x 6 x 10. The latter pumps are of the duplex high pressure, outside packed type, and brass fitted throughout. For handling the returns from the heating system, two vacuum return pumps are installed in duplicate. Each pump is 10 x 16 x 16, brass lined. Tobin bronze piston rods and fitted with a special fibrous packing to resist boiling water.

GENERATING EQUIPMENT

This consists of four generating sets, three 300 K. W. each and one 150 K. W. units. The engines are of the tandem compound Corliss type, large units, 17 x 30 x 36, the small one being 12 x 22 x 30. The engines, of course, are run non-condensing, the exhaust from them and also from the pumping equipments, being used in the heating system and for heating the domestic hot water supply. The engines run at approximately a seed of 110 R. P. M. and are direct-connected to Westinghouse direct-current compound-wound generators.

POWER PIPING

The greater part of the high pressure piping is located in the boiler room, with a consequent minimum amount of piping being found in the general machinery room. The main steam header carried back of boilers is cross-connected to a second or auxiliary header, so that an elasticity of steam distribution is secured. High pressure leads are run from the boiler room headers through the intervening wall to the various engines, pumps and incidental apparatus requiring live steam.

A high pressure connection is made to the heating system for periods when there is an insufficiency of exhaust. Another high pressure connection is run to the riser carried in turn to the Luncheon Club Kitchen steam apparatus located on the twenty-sixth and twenty-seventh floors.

The exhaust steam from all engines, pumps, etc., is carried in trenched lines, all of which terminate in a 24-inch O. D. main connected to a combined muffler tank and grease extractor. This apparatus has a three-valved by-pass and beyond later a 10-in. exhaust connection is taken to a single leg or "dead end" Webster open feed

water heater. Beyond the above connection is located the back-pressure valve and from the latter the outboard exhaust is carried outside of the building and up along the smoke stack a distance of approximately 475 ft.

Emergency or non-return valves are installed in the high pressure piping at each boiler. Steam separators are provided in piping leads to engines, etc., and every provision has been made to drip all piping throughout. All clean drips are returned to the boilers by the Holly loop system.

The above general description will give one a fairly good idea of the size of this isolated plant. The building uses on an average of 150,000 to 160,000 K. W. hours per month, the daily coal consumption averaging from 18 to 20 tons (long). For the day period the boiler plant is handled by two firemen and one coal passer. The total water consumption for all purposes runs from 2,500,000 to 3,000,000 gals. per month.

HEATING EQUIPMENT

The heating, quite naturally in a building of this nature, is by direct radiation. It is installed on the two-pipe up-feed type, the exhaust steam being circulated throughout the general distributing system on a low vacuum. The Webster system of exhaust steam heating is employed, but the general installation is one of rather an unusual nature. The refinement consisted in combining with the above, the desirable features exploited by Charles A. Ball, and used by him on some very extensive heating systems employed in the Eastman Kodak Company's plants in Rochester, N. Y. The advantages secured in this combination system was the control of the vacuum. Considering the velocity of the downward flow of all condensation in a building of this height, it was designed to receive all main and steam riser condensation in a separate horizontal pipe, termed a "base" or sump line. This base line is so installed that it relieves to the sump, with a controling valve, for washout purposes and that upon the closing of the valve to sump, the condensation should seal and flood up to and overthrow into the feed-water heater. This provision simplifies and considerably reduces the work upon the vacuum pumps and consequently avoids the continued use of a jet to condense any re-evaporation (flashing) of this highly heated water at the pump.

A main return was installed to extend around the base of the plant, in manner very much similar to the "base" or sump line. This line receives all condensation from the radiation, coursing to the base of the plant, through the vertical return piping or return risers. The terminal of this main return connects to the section of the vacuum pumps, and is termed the main high vacuum line, for distinctions further on explained.

Seven separate parts or divisions termed "divisional units" were provided, one exclusively for the hot-blast apparatus, and the total aggregation of direct surface, divided as nearly equal as practicable, to form the other six divisional units.

A 1-in. vacuum controller was installed for each unit, so that just that degree of lesser vacuum could be maintained, necessary for a circulation in each unit, as related and distinguished from all other units.

A special vacuum trap is installed for each unit. This trap has a conical opening downward in the direction of the vacuum pull, with float regulation, discharging only that excess of water above the normal water line of trap. All traps are slightly elevated on foundations, so that a seal in the main return on the low vacuum side of the system is maintained equal to the distance from the inlet port of trap to the high vacuum line below.

The exhausting apparatus, as before referred to, consists of the two vacuum pumps set in relay and so

reciprocally piped and valved, that either pump can be run at will. The pumps run free and uncontrolled, as the controller permits any regulation needed for the lesser degree maintained in the several units. To reduce the amount of jet water (generally overflowing the feed water heater and wasting in many vacuum return systems), a surface condenser or small closed heater was installed to function reciprocally with either pump. A direct service city water main was diverted to the condenser, with a by-pass, the pipe continuing and connection being made to the suction port of the house pump, discharging to the house tanks located at the top of the building.

Owing to the great volume of this water service supply, it is not warmed more than a few degrees above the entering temperature. The condenser is a Wainwright, 100 H. P. feed water heater, placed horizontally between the two vacuum pumps, and so arranged that the condensation courses through the interior pipes or tubes, and the condensing water in the outer space, thus making a surface condenser with no waste of the condensing medium.

The hot blast apparatus has each section controlled by a swing check, closing the section against a backlash or return of water to the section, due to the condensation vacuum when the steam valve will be closed. A reduced tee is installed beyond the check, on each separate return from the sections, and an air line with globe valve on each connects to the main air line, to which the controller is applied.

In this manner the lesser degree of vacuum maintained by the controller is further regulated for the requirements of the individual sections, as they are related to the incoming air, and consequent differing condensation volumes.

During temporary heat and before the building was completed, the Webster return water seal motor valves were installed without their interiors or floats. Steam was thus circulated through these full openings of all radiators to the branch and main return piping, thus securing a complete wash-out of all oil, lead chips, core sand and kindred sediment from the entire system of radiators and piping.

As the plant is run to-day the low speed of the vacuum pumps maintains approximately 13-in. to 16-in. vacuum at the pump, approximately 3-in. at each trap and a general circulation of approximately ¾-in. vacuum throughout the entire system.

The operation of the entire plant is in every way satisfactory and is probably one of the most economically operated office building plants in New York. The total equipment of direct radiation installed approximates 100,000 sq. ft. The heating system contains fifty sets of rising lines, most of which terminate at the twenty-sixth floor, thirteen sets being carried up to the thirty-second floor in the tower portion of the building. There is a total of approximately 2400 direct radiators, six indirect or reheater stacks used in conjunction with the heating of the Broadway entrance of the first floor large main hall and one hot blast or tempering coil employed for preheating the incoming air and safeguarding the air washer sprays from freezing.

The main Broadway entrance hall as above referred to is heated by direct radiators which are installed of the direct indirect type. From the general fresh air supply duct system in sub-basement a branch duct is taken to six reheater or indirect stacks located in sub-basement pressure tank, Broadway wing. From these stacks flues are run up to the hall direct radiators referred to above. This combined form of heating the large arcade insures a generous quantity of warm air and tends to overcome the cold drafts so prevalent in large entrance halls or corridors. The major heating mains (each

starting 14-in. O. D.) are run level without pitch, and drippage is secured by means of the turned down (45°) riser lateral connections. The base of each riser is carried down and dripped into the "base" or sump line. Stop valves on risers are installed above the tee connections to supply mains, thus insuring constant dripping of the latter at all times. All vertical lines, risers, etc., are fitted with double sets of brass sleeve expansion joints, installed generally on the seventh and sixteenth floors, the pipes being anchored at the third, twelfth and twenty-first floors.

All pipe used throughout is genuine wrought iron and for the low pressure mains, the connections and fittings 5 in. and larger are of the flanged type.

VENTILATION

The mechanical ventilation installed in this building is as follows:

Supply and exhaust ventilation for boiler, engine room and the general sub-basement quarters. Exhaust ventilation for the typical toilet rooms on all floors throughout. The supply ventilation for the sub-basement consists of a preheater coil for guarding the air washer sprays in freezing weather. This coil is automatically controlled by a system of temperature control. The remaining equipment consists of an air washer, for cleaning all incoming air (taken at sidewalk level on Cortlandt street), an electric 50 H. P. motor driven pressure fan having a wheel 10 ft. in diameter by a center width of 5 ft. 1 in. This fan supplies fresh air by means of a ramificated system of galvanized sheet metal ducts, which are carried in the hung ceiling to innumerable grilles, well located throughout engine and boiler rooms, so as to insure a good distribution of fresh air where most needed.

The exhaust ventilation for this floor emulates somewhat the supply, the grilles being well distributed and placed flush in the hung ceiling, where the warm air is collected. The exhaust ducts are also carried in this false ceiling space and terminate in an exhaust steel plate fan having a 10-ft. diameter blast wheel, the width of the latter being 4 ft. 3½ in. This fan is directly driven by a 40 H. P. electric motor. The foul and hot air handled by this exhaust fan is discharged in an upcast carried up in the easterly interior court. All supply drop connections in the boiler and engine rooms are carried down from the hung ceiling and to such heights above floors as to favor best the operating forces and, further, to prevent the short circuiting of fresh air to the exhaust openings. The exhaust ventilation for the two sets (east and west sides) of typical floor toilets is handled by 80-in. and 90-in. steel plate exhaust fans located in pent houses on the twenty-seventh floor level. The latter fans are directly driven by electric motors.

Edward Baxter is the superintendent and operating engineer in charge of the entire equipments. Francis H. Kimball was the architect of the building, and Griggs and Holbrook acted in the capacity of consulting, designing and supervising engineers for the mechanical and electrical plants.

Car Ventilation

A DISCUSSION OF A PAPER ON THIS SUBJECT, READ BEFORE THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS*

PRESIDENT BOLTON: This paper, if it did nothing else, would show that the public has reached the point of taking an interest in the great subject of ventilation, because it is only by means of public demands that railroad companies will go to the expense of even testing or trying out ventilating systems.

In the New York City subway, I believe I am justified in asserting that the average space occupied by a passenger in the rush hours does not exceed 80 cu. ft. It is easy to see how soon a restricted space such as that will become foul. To afford the amount of air required by the Chicago ordinance, or 350 cu. ft. per passenger, would effect about four changes of air in such a crowded car per hour, which is a very moderate amount of ventilation under such circumstances.

Some of the New York subway cars

*Published in THE HEATING AND VENTILATING MAGAZINE for September, 1911.

recently have been equipped with vertical agitator fans, four in each car, suspended from the ceiling. They are wide-bladed, slow-speed disc fans, with direct-connected motors. They produce a pleasant down-draft and agitation of the air in the car and are effective in minimizing the heat and pollution of the air of the car and of the subway.

MR. NATKIN: I had occasion to discuss this subject with an engineer employed by the Chicago elevated railroad. It had been the custom to run four- or five-car trains, carrying a smoker as the last car. This engineer made a number of tests for carbon dioxide on various cars, particularly on the express service. For a distance of five miles, where the running time is 11 minutes, he found that the carbon dioxide increased about 1% in all cars except smokers, where it increased 200% or 300%. The reason for placing the smoker at the rear was to prevent the smoke from entering the other cars. They then tried the experiment of running the smoker as the first car, figuring that it would thus have more ventilation, due to the speed of the train. They found that arrangement reduced the carbon dioxide materially.

The Forthcoming Federal System of Heating and Ventilating

An idea of what heating engineers may expect to find in the forthcoming publication of warm air furnace ratings and the Federal system of heating and ventilation, soon to be issued by the Federal Furnace League, is given in an address made at the recent convention of sheet metal contractors at Omaha, Neb., by Dr. W. F. Colbert, the engineer of the league.

Dr. Colbert said that when the full furnace ratings were published and with the Federal system of heating and ventilation at hand, it will be possible to calculate the sizes of warm air pipes and registers, vent ducts and registers, fresh air duct, fresh air room and fresh air intake window, ventilating shaft, chimney and furnace in an average time of 2 minutes per room, after the measurements have been taken from the plans. At that rate, the figures for an 8- or 9-room house, with bath, could be set out in approximately 15 minutes.

This simplification of estimating methods has been devised on account of the impossibility of a dealer's spending the necessary time to experiment on the heat losses through glass and walls under varying wind and temperature conditions. Yet, heretofore, that is the only way he could secure the information, because all the heat loss data in text-books is based on laboratory experiments in still air, and still air never occurs outdoors.

Speaking further of the present difficulties in the way of properly designing warm air furnace systems, Dr. Colbert said that after the heat losses are procured, it is necessary, under present conditions, to determine the register temperature of the warm air in zero weather and to calculate therefrom how many B. T. U. would be available, from each cubic foot of warm air delivered into the room, for offsetting the heat losses. It is also necessary to determine the average velocity of the flow of air through the pipes to the first, second and third floor rooms and the differences in the percentage of friction in the various sizes of pipes. Then special inquiry has to be made concerning the actual percentage of free air space in register faces and the percentage of friction that would be allowed, because the air is divided into very small columns instead of coming through the register as it comes through the warm air pipe, in one large column.

With this information at hand, it is possible to find the size of heat pipe and register required to heat the room

after an hour of hard work. This operation has to be repeated for every room to be heated and every ventilating or air circulating duct.

Then it is necessary to add together the B. T. U. heat losses from all the rooms to be heated, plus a percentage for heat losses in cellar piping and to determine the size of furnace required. Here is the difficulty, for up to the present time no furnace is rated in British thermal units.

Dr. Colbert added that he knew it is quite common to allow 8,000 B. T. U. for every pound of coal burned per hour and to allow from 4 to 6 lbs. of coal per square foot of grate surface, but he stated that in the tests conducted by the Federal Furnace League, it was found that the B. T. U. delivery from a pound of coal showed a variation of 30% in one series of furnaces and there is a difference of about 40% between the best furnace and the poorest furnace tested to date. In addition to these variations, the league has found many differences between the published size of fire-pot and the actual size, amounting, in some cases, to as much as 2 in., and it was also found that the fire-pots are just as likely to be larger than the published size as they are to be smaller. In fact, it was quite common to find variations both ways in one series of furnaces.

Then, after making more or less of a guess at the size of furnace required to heat the building, it has been necessary to determine the proper size of fresh air duct, fresh air room and fresh air window, for more than one otherwise good installation has been ruined by a fresh air intake window that is entirely too small. Moreover, if a ventilating system is included with the heating plant, it has been necessary to make complicated calculations to determine the proper size of main vent shafts.

According to the forthcoming Federal system, there are only a few calculations for each room, in such small numbers that, with a little practice, they can be done by mental arithmetic. Then the heat losses from all the rooms to be heated is totalled up by adding the line of figures. After that is done, it only remains to refer to the printed tables, included in the League's system, for the sizes of everything needed to lay out a complete job and then to look in a furnace catalogue for the number of the furnace required.

150 MORE FURNACES TO BE RATED

In connection with the work of testing warm air furnaces, which has been under way for over a year at the League's Philadelphia testing plant, Dr. Colbert stated that before closing down for the summer, completed rating tests had been made on 38 furnaces from eight manufacturers. From these test results and the measurements of the other sizes of the same series, taken since the tests were made, it will be possible to rate more than 80 furnaces in the 17 series represented. The league has at the testing station or has promised for immediate shipment about 60 furnaces from nine other manufacturers. From the tests on these furnaces the league will be able to rate about 150 furnaces in the 27 series represented.

The furnace testing, Dr. Colbert stated, is undoubtedly going to stimulate interest in furnace design. At this early date several of the members are at work making more or less important changes in the furnaces tested. Two of them are at work on entirely new designs, with the idea of surpassing the results obtained in the tests on their present lines of furnaces. There are others whose furnaces are listed for tests who have stated their intention to try to improve their furnaces as soon as complete reports are in their hands. This promises well for the development of better furnaces.

There can be but one conclusion, said Dr. Colbert, from the league's experience to date; that is, that united effort on the part of manufacturers of and retail dealers in warm air furnaces will surely result in making furnace heating, with ventilation, as fashionable and profitable as hot water heating was ten years ago.

Ventilation for a Compact Theatre Building

MECHANICAL EQUIPMENT OF THE FOLIES BERGERE, NEW YORK'S NEW TYPE PLAYHOUSE

As severe a test of modern ventilation methods as one is likely to find has been successfully met in the case of the Folies Bergere, on Forty-sixth street, near Broadway, New York. This unique playhouse is not only compact to a degree but has facilities for serving warm meals, both in the body of the theatre and in the first balcony, during the progress of the play. The kitchen, moreover, is directly under the orchestra, so that the ventilation problem includes not only the freshening of the air supply but also the elimination of all cooking odors and excessive heat from the ranges. The satisfactory solution of this problem lends unusual interest to the methods employed which are a striking proof of the efficiency of present practice under extremely trying conditions, for the management states that the air at all times is both fresh and odorless.

Courtesy of Architecture and Building

FOLIES BERGERE, NEW YORK

The mechanical equipment of the theatre includes a refrigerating plant and a sprinkler system, but the present

Courtesy of Architecture and Building

ORCHESTRA DINING TABLES FOLIES BERGERE

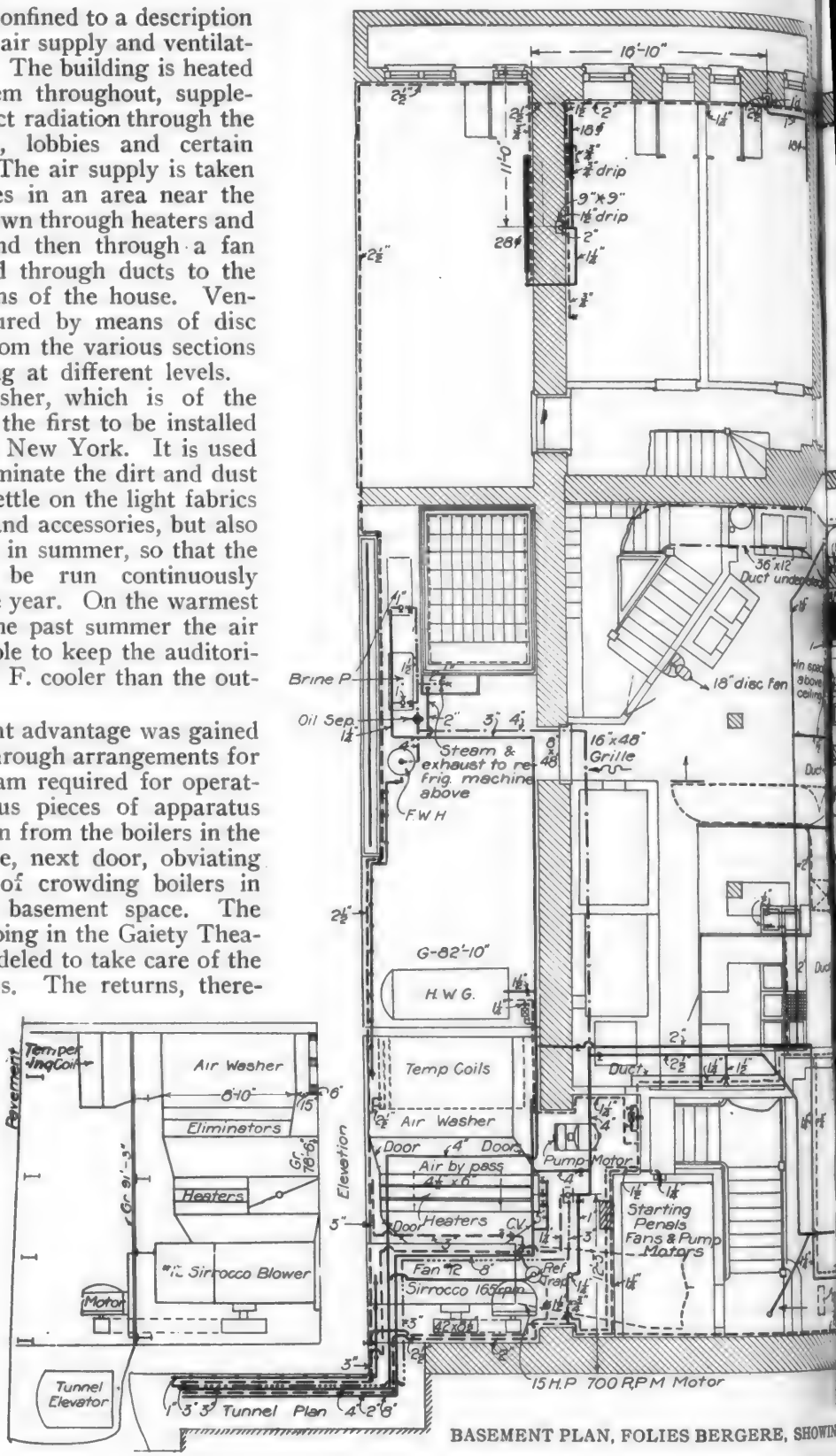
Courtesy of Architecture and Building

KITCHEN OF FOLIES BERGERE, NEW YORK, SHOWING STEAM CONNECTIONS TO RANGES

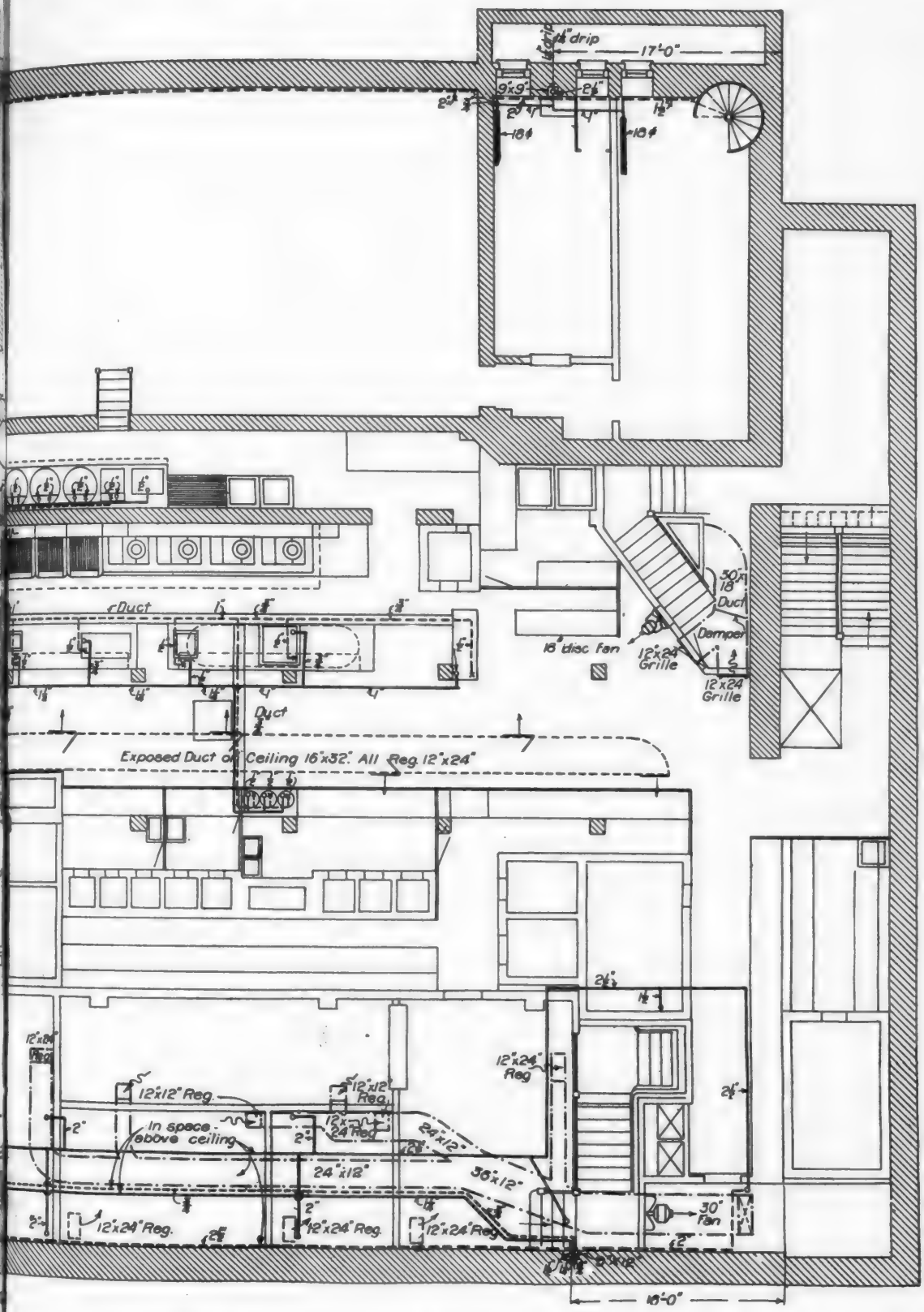
article will be confined to a description of the heating, air supply and ventilating apparatus. The building is heated by a fan system throughout, supplemented by direct radiation through the stage portions, lobbies and certain other places. The air supply is taken through louvres in an area near the street level, drawn through heaters and air washers and then through a fan and discharged through ducts to the various portions of the house. Ventilation is secured by means of disc fans pulling from the various sections and discharging at different levels.

The air washer, which is of the Acme type, is the first to be installed in a theatre in New York. It is used not only to eliminate the dirt and dust which might settle on the light fabrics on the tables and accessories, but also to cool the air in summer, so that the theatre may be run continuously throughout the year. On the warmest days during the past summer the air washer was able to keep the auditorium 10° to 12° F. cooler than the outside air.

An important advantage was gained at the outset through arrangements for taking the steam required for operating the various pieces of apparatus requiring steam from the boilers in the Gaiety Theatre, next door, obviating the necessity of crowding boilers in the restricted basement space. The boilers and piping in the Gaiety Theatre were remodeled to take care of the new conditions. The returns, there-



BASEMENT PLAN, FOLIES BERGERE, SHOWIN

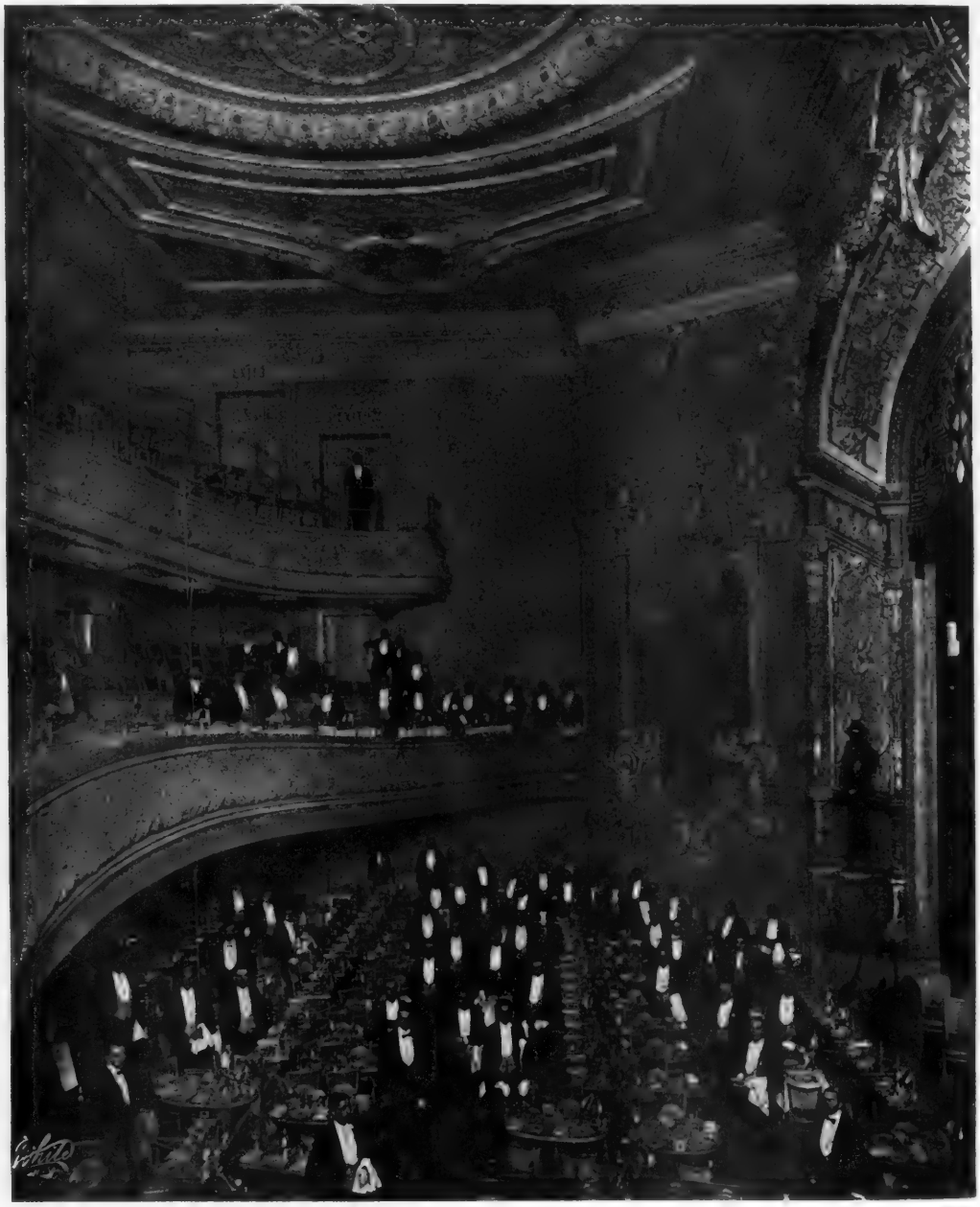


MECHANICAL PLANT AND ARRANGEMENTS FOR SUPPLYING AND EXHAUSTING AIR FROM KITCHEN

fore, from the entire system are carried back into the receiver in the adjoining building.

Into this receiver are also returned the vacuum returns from the Gaiety Theatre building; the Folies Bergere building being run as a gravity down-feed system.

The piping on the boilers in the Gaiety Theatre building was entirely remodelled; the two boilers being made into high-pressure boilers, having an allowable working pressure of 60 lbs. Steam for heating the Gaiety Theatre and Folies Bergere was taken through separate pressure-reducing valves into the heating system in each building; and a high-pressure line was taken from the boiler header into a specially constructed separator before it was



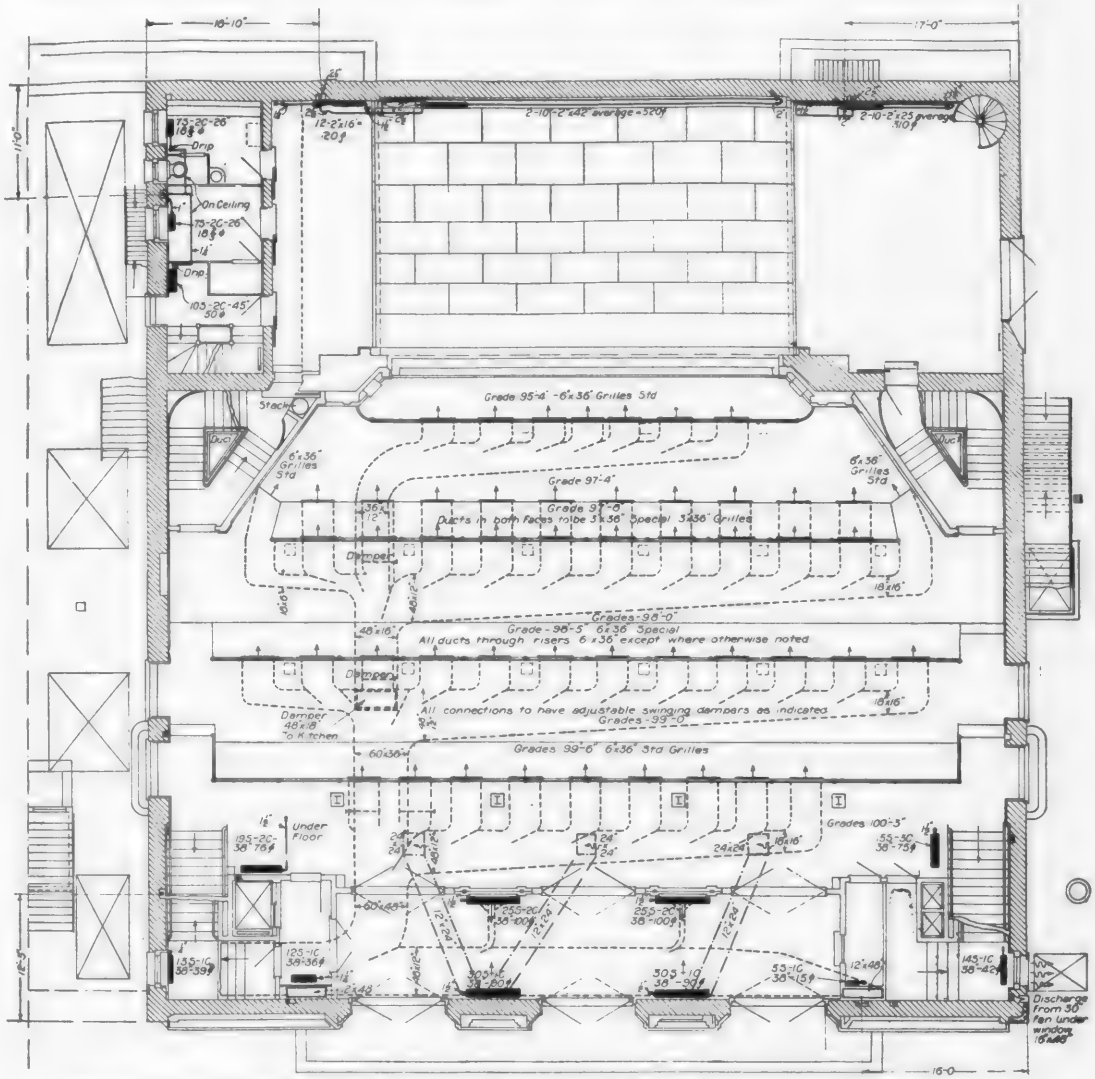
Courtesy of Architecture and Building

GENERAL VIEW OF AUDITORIUM, FOLIES BERGERE, NEW YORK

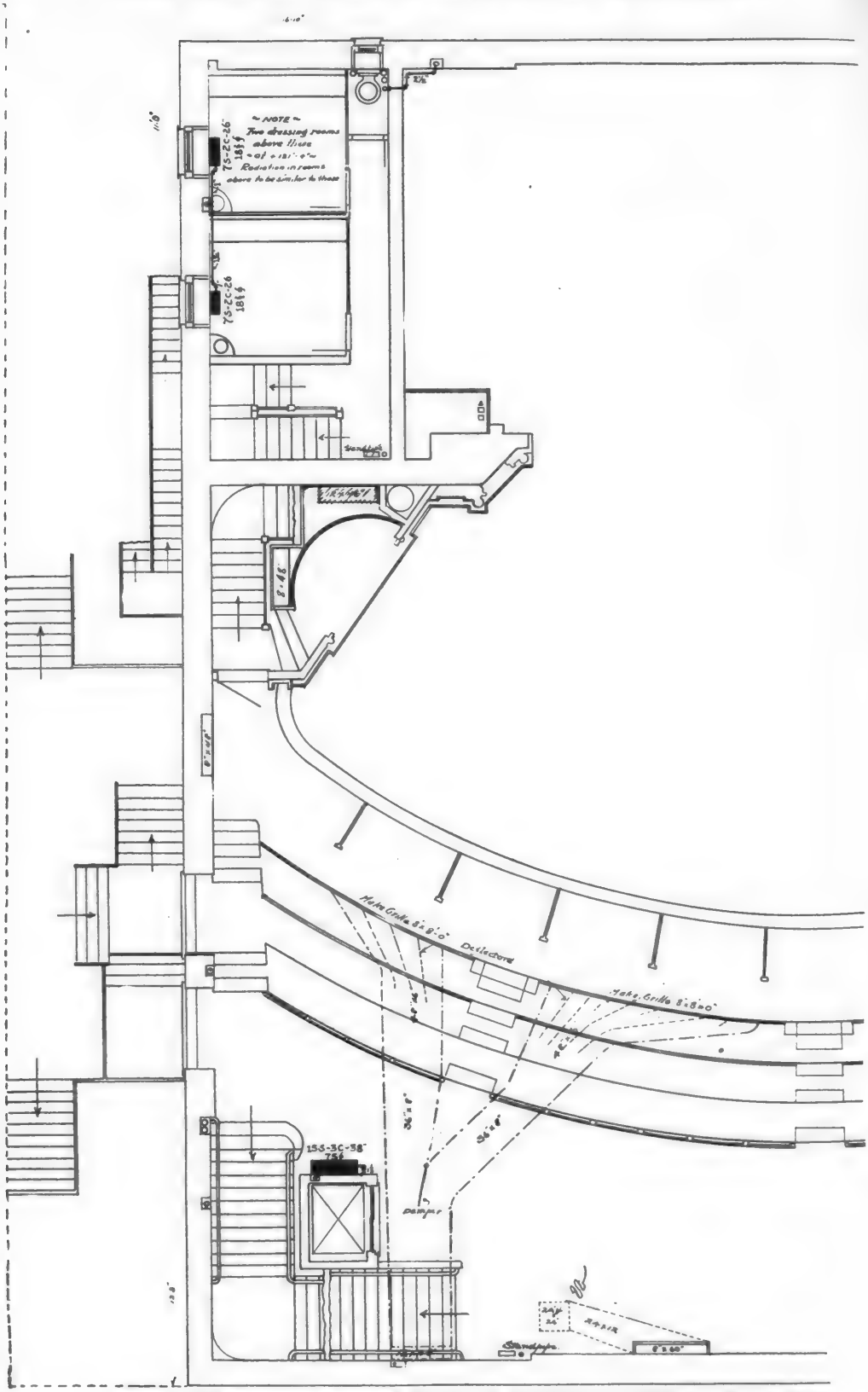
continued into the high-pressure apparatus. This separator was deemed necessary because the boilers, being originally intended for low-pressure work, had small steam spaces, and it was thought that they might prime if forced; consequently, a special separator was installed, not only to remove the water that might be carried off, but actually to act as an auxiliary steam space. The high-pressure line then continues into the refrigerating apparatus, two brine pumps, the kitchen apparatus, and hot-water generator.

A line was also carried up to the top floor, on which a buffet pantry was to have been fitted up. This high-pressure line was also connected into the torch line on the roof, in case the exhaust steam was not sufficient to operate these torches. Each kitchen fixture has a separate valve on the supply and a check valve on the return. One main valve controls the supply and the returns for the entire kitchen fixtures are returned through a valved trap into the returns. All returns discharge into the main return, going back to the return tank, the returns from the kitchen apparatus being run in trenches.

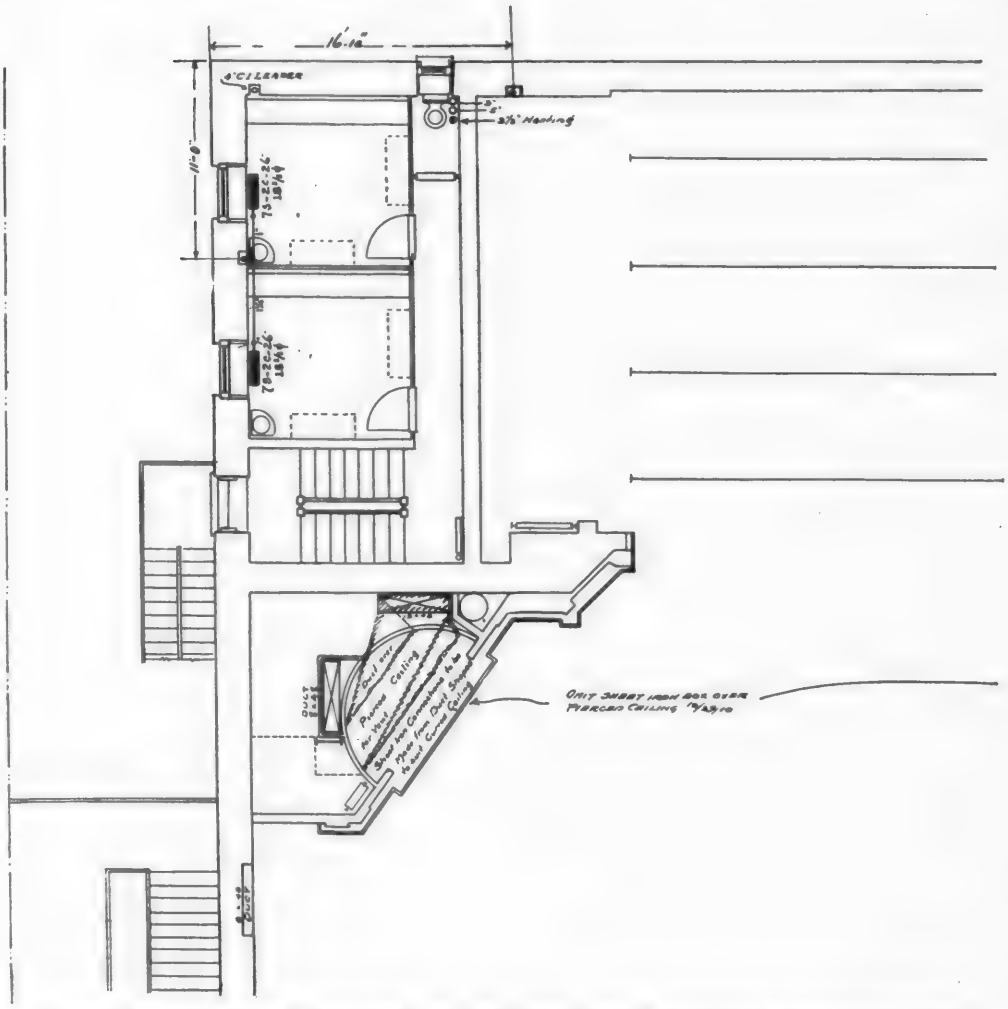
The exhaust piping from the brine pumps and compressor is carried


Grade 95'-4" - 6'x36" Grilles Std
Grade 97'-4"
Grade 97'-6"
Ducts in both faces noted 3'x36" Special 3'x36" Grilles
Grades-98'-0"
Grade-98'-5" 6'x36" Special
All ducts through risers 6'x36" except where otherwise noted
All connections to have adjustable swinging dampers as indicated
Grades-99'-0"
Grades 99'-6" 6'x36" Std Grilles
Grades 100'-5"
Damper 48'x18" to Kitchen
Discharge from 30" fan under window 18'x48"

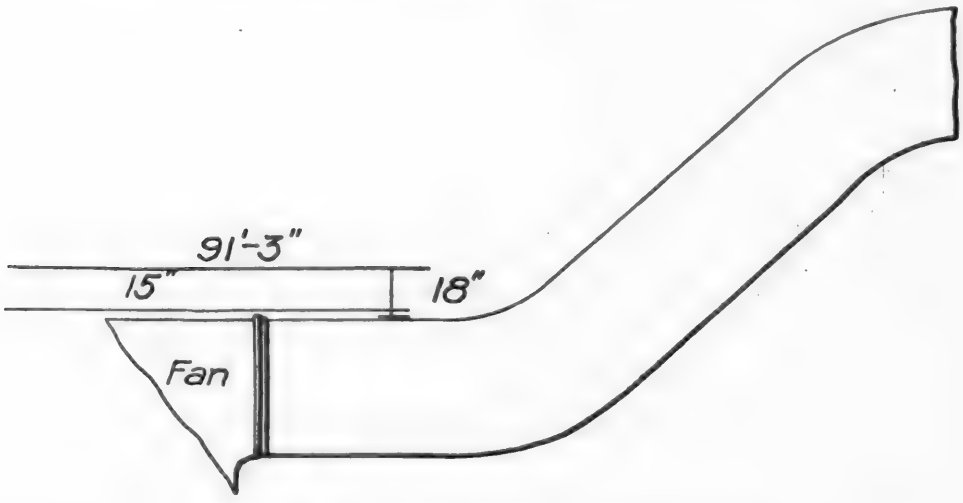
FIRST FLOOR PLAN, FOLIES BERGERE, SHOWING AIR DISTRIBUTION TO ORCHESTRA



HALF PLAN OF BALCONY, FOLIES BERGERE, SHOWING AIR SUPPLY DUCTS



PART PLAN OF FOLIES BERGERE AT GALLERY LEVEL, SHOWING ARRANGEMENTS OF VENT DUCTS

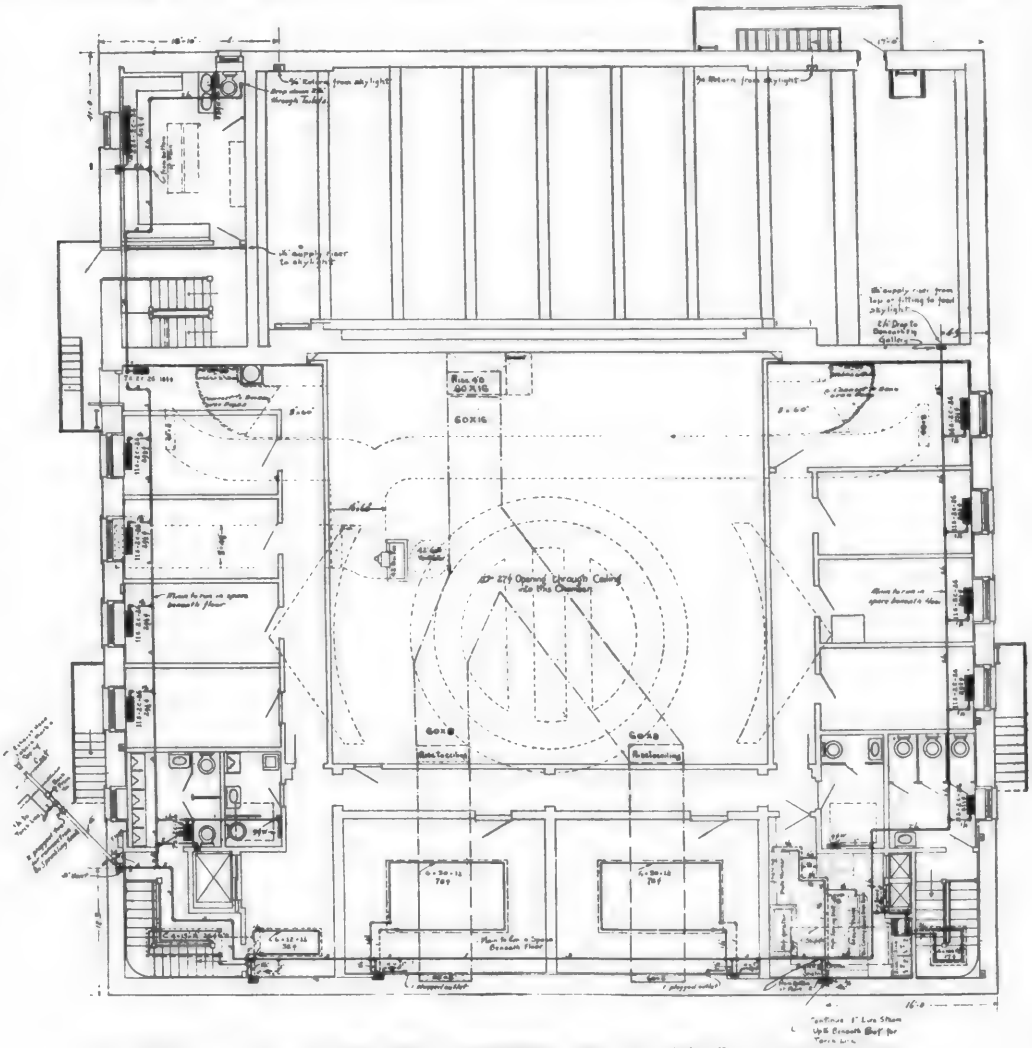


DETAIL OF AIR DUCT LEADING TO FIRST FLOOR

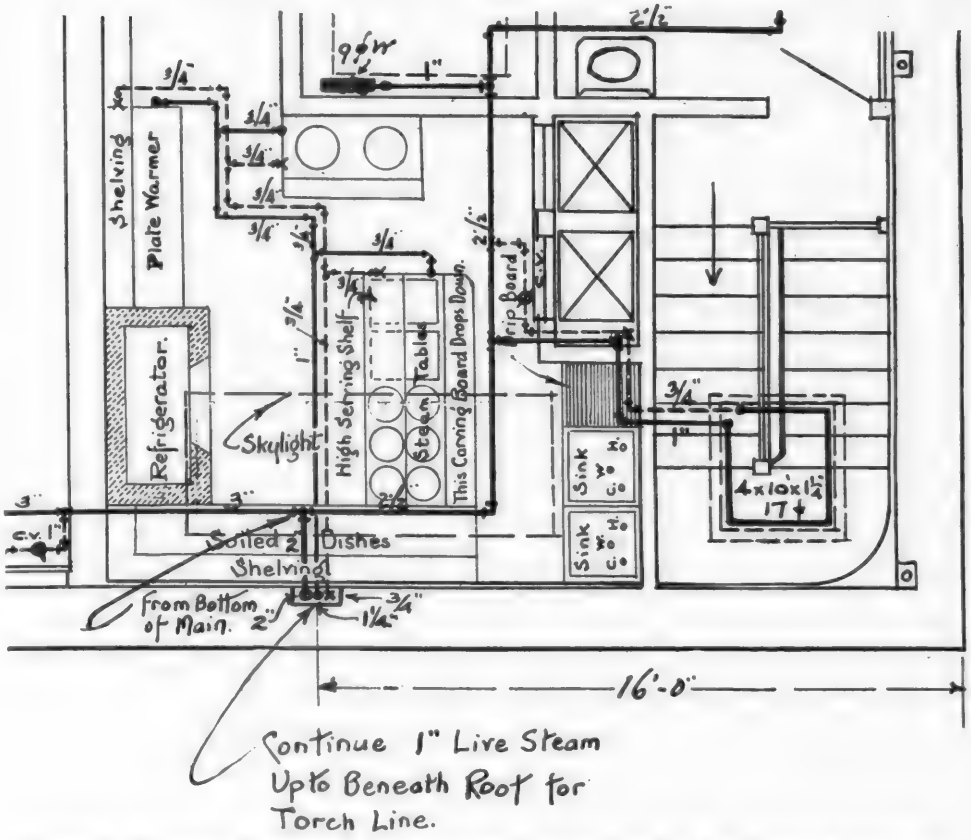
through a feed water heater of the Berryman type, and then back into the main exhaust system, for supplying steam for heating purposes; and also through a 4-in. riser to the roof, where this riser is capped with an exhaust head, below which is the back-pressure valve. Below the back-pressure valve connections are taken off and carried around the front of the building, and perforated outlets made in back of each torch in front of the building. This torch line is supplemented by means of the high-pressure line, brought up for the buffet pantry, as previously mentioned.

The air supply and ventilation constituted the most intricate problem confronting the engineers. On account of the large amount of heat and smell from the food it was necessary to provide more fresh air and more ventilation than ordinarily would have been required.

The fresh air for the building is brought in from the court, through a stack of Vento cast-iron hot-blast heaters, two sections deep, controlled by a thermostat working from the cold air inlet. The air is carried through a Thomas Acme air washer, which has a capacity of 40,000 cu. ft. of air per minute, and which is constructed with an extra row of spray nozzles for additional cooling effect in the summer. The air is then carried through three sections of Vento hot-blast heaters, controlled by a thermostat, working



LOFT PLAN, FOLIES BERGERE, SHOWING VENT DUCTS FOR AUDITORIUM, AND STEAM CONNECTIONS FOR BUFFET PANTRY



DETAIL OF STEAM CONNECTION TO BUFFET PANTRY IN LOFT OF FOLIES BERGERE

from the auditorium, and then through a No. 12 Sirocco fan, driven by a 15 H. P. Sprague belted motor. The air is discharged through ducts and flues to the various parts of the auditorium, the balcony, and boxes, and a separate duct to the kitchen.

It is so arranged that the air changes in the kitchen shall be at the rate of about ten changes an hour, and five changes an hour in the auditorium, when the fan is run at 175 R. P. M.

All of the air in the auditorium comes in at the floor level, and all the exhausting of the air takes place at the ceiling, so that the smoke and odors will rise quickly, and no smoke shall interfere with the view of the stage.

The venting of the auditorium is accomplished by means of a 72-in. belt-driven disc fan, located in a house specifically constructed for it on the roof, and connected by means of openings and ducts to the chamber over the auditorium. The toilets and cloak rooms are separately vented by means of a 30-in. disc fan discharging into the west court.

The kitchen is independently vented by means of a 42-in. disc fan located in an air-tight chamber over the auditorium ceiling, and then discharging to the roof. This fan is connected by means of vertical flues and ducts to a vent duct over the range hoods, and to all register openings in both the stairs to the kitchen, to prevent any possibility of smells arising from the kitchen into the auditorium. A fan was placed in each wall of the stairways leading to the auditorium from the kitchen, these fans discharging back into the kitchen. This arrangement proved most successful in preventing any smells of any kind arising through the stairways.

The architects of the Folies Bergere Theatre are Herts & Tallant, New York. The entire mechanical equipment was designed and installed by Francis Bros. & Jellett, Philadelphia and New York.

The Problem of Sub-Basement Ventilation

A paper by D. M. Quay on the ventilation of the Macy department store in New York, which was read at the recent summer meeting of the heating engineers, brought out a discussion of the difficulties of sub-basement ventilation, together with some useful hints for reducing the excessive temperatures in engine and boiler rooms. James H. Davis stated that in Chicago there is considerable discussion going on over this matter between the contractors and the city authorities. In one hotel, he said, it had been planned to arrange sleeping quarters for the engineers and some of the help in the sub-basement. The authorities would not permit it, although it was shown that sufficient ventilation would be provided.

MR. L. C. SOULE: There is one plant in Chicago where the basement ventilation of a department store is accomplished by introducing all the fresh air on one side, blowing same across the room and exhausting it on the other side. It seems to me that if the right proportions are used, that is a very good method. The intakes and exhausts are located well up on the walls, near the ceiling. The room is about 60 feet wide.

PROF. JOHN R. ALLEN: There is one difficulty I sometimes meet with in sub-basement ventilation, particularly in one case I have in mind, in which the difficulty was due to the fact that the air increased in temperature after passing any considerable distance into the room. When we first made this installation we found that taking the air in at the ceiling, with its temperature at 65°, and then letting it pass the full length of the room and exhausting it from the kitchen, say, a distance of 75 ft., the temperature of the air was increased 5° or 6°—in extreme cases as much as 8°. We had to make a change in our plant and introduce air at the opposite end of the room in order to keep down the temperature.

PRESIDENT BOLTON: The removal of heat in the engine and boiler rooms presents peculiarly variable problems. The introduction of air under pressure into engine rooms as a means of ventilation is of little value, as the cool air becomes heated almost immediately, and such a supply must be supplemented by large venting or exhausting apparatus. I had to ventilate an engine room in a large hotel in New York in which the temperature in the summer-time was as high as 115°, and brought it down to 110° by reversing the supply fan and using it as an exhauster, when the fresh air readily found its way in through the opening from the exterior atmosphere. The main thing is to get the heated or expanded air out of the room and then allow fresh air to find its own way in.

MR. SOULE: In one boiler room in Chicago the heated air is carried from the tops of the boilers through ducts and forced by fans under the boilers, where it is discharged through Jones stokers. That is a very good method of decreasing the temperature of the air so that it will not affect the first floor. Of course, there was a separate fan supplying fresh air for the men. The travel of this air was across the room.

Ventilators on Bottoms of Cars

"In Chicago the elevated railway company," says Mr. Benj. Natkin, "has now provided ventilators on the bottom of the cars—a V-shaped projector, five being placed on each car. By running the smoker ahead, and with the assistance of these ventilators, the air is not at all objectionable, the increase of CO_2 being not over 50% more than when the car is empty. I might add that the cars are of the open-platform type and the doors were kept closed. Practically all of those new cars have been built by the Pullman Company, principally for the Twelfth street line, which is patronized largely by laborers. I had occasion to ride on that line when the old cars were running, and you can readily notice the difference in the air with the new cars. While the air now is not as pure as on some of our other lines, there is a great improvement."

So-Called Superiority of Exhaust Steam Over Live Steam for Heating

A further expression of views on the part of heating engineers as to the comparative efficiency of exhaust and live steam for heating purposes was given at the recent heating engineers' meeting in Chicago in connection with a special topic on the subject.

Prof. J. D. Hoffman said he thought this was a case where a general statement has been based on local conditions. "You cannot get something for nothing in this world," he added. "If you take live steam into an engine cylinder, that live steam having 1,000 or 1,200 B. T. U. in it, or dry steam, and put it through the cylinder, doing work as it passes through, it comes out as exhaust steam, with less heat in it than when it went in. I do not see any other way out of it. Now, if it has less heat in it when it comes out there is less heating capacity."

PRESIDENT BOLTON: I have never seen definite results evidencing superiority in exhausted steam for heating purposes, and I fail to see how it can afford more heat than live steam. It is probable that, in some cases, particular conditions have obtained in which exhausted steam has been so connected to a heating system as to inject itself through the system in a better manner than would take place with live steam through the reducing valve, and in that way a better circulation may have been attained, which has led to the idea that the result was due to superior value of exhausted steam. I have seen live steam connections made into exhaust steam heating systems in such a defective way that it has placed the live steam supply at a disadvantage. While exhaust steam was injected directly into the system, the live steam supply was injected at right-angles, and, in some cases, the reducing valve was too small, and, in other cases, the live steam supply had to follow tortuous passages and bends to get to the heating system.

MR. W. M. MACKAY: In following up the argument that has come to us from time to time, I believe the statement has been made largely by men who advocate vacuum systems of heating, their claim being that the lower the temperature of the heating medium or steam, the greater its heating efficiency.

PRESIDENT BOLTON: In discussing this matter with some very ardent advocates of the superiority of exhausted steam, I suggested that it might be possible that moisture-laden steam would have a better effect inside of a radiator than the dry steam. A radiator has a very moderate amount of interior cubical space, while it has a large amount of thin surface exposed, and moisture in the steam might gather on the interior surface and afford a better means of conveying heat to the surface than the dry or superheated steam in contact with that surface.

MR. GIFFORD: While it may be illogical and, theoretically, it is absolutely impossible, nevertheless I believe that, practically, exhaust steam goes further in heating effect than live steam. There are numerous buildings where the use of the engine as a reducing valve enables them to be heated at a lower fuel expense than when live steam is used through the ordinary reducing valve. I think the problem lies in connection with the relative amount of moisture in the steam.

In one installation in the plant of Louis Hance & Co., in Chicago, the building was entirely enclosed by December, and the janitor started up the heating plant prior to the installation of the engine. The boiler plant and the vacuum heating system were complete. The boiler capacity was greatly in excess of what the heating system should condense in heating that building, but the building would not heat, and the vacuum heating system was, of course, held responsible for it. All we could say was: "Wait till the engine is connected up and you will see the exhaust steam going to waste." That came to pass.

In this connection, I believe the proper connection for the live steam

through a reducing valve is in the top of the feed water heater and not in the usual place, so that the live steam, when delivered there, can pick up the necessary or proper amount of moisture.

PRESIDENT BOLTON: I have heard of a system installed in New York City in which the return water is bled into the steam supply pipe with the idea that the steam will absorb some of the moisture as it passes along, and have been told that this arrangement will be tried out this winter, to see if the humidifying effects of superheated steam has any effect on the interior surface of the radiator. That alone can explain any proven superiority, if such exists, because there is no more actual heat in exhaust steam, but less, than live steam.

PROF. JOHN R. ALLEN: I think there is no question but that moist steam carries heat better than live steam. In my experience, superheated steam is a very poor conductor of heat. Superheated steam is very dry. When you increase its moisture you increase its power of conduction. That is very well shown in the steam engine. If you take any ordinary engine and have it operated so as to have dry steam at the exhaust, you will get less condensation on account of less heat transmission to the cylinder walls. It has the same effect in radiators. If our steam is moist we will get a much greater heat transmission to the wall than with a dry steam. How we can get any greater amount than the total amount of the heat is, of course, a question.

MR. J. F. HALE: Some years ago there was a plant installed in a building with which I am familiar. Low-pressure boilers were used for heating the building, and it was specified that steam should be taken direct from the boilers without a reducing valve direct into the heating apparatus at 5 lbs. pressure. There was a vacuum heating system attached and it was impossible to get satisfactory results. The steam would not carry into the far points. The company whose apparatus was installed insisted that the reducing valve should be used in order to remove the moisture that was being carried directly from the surface of the water into the heating mains, and at their own expense they made a careful calorimeter test of the steam under both conditions. They found that when passing steam through the reducing valve a superheated condition prevailed in the steam and the building was heated successfully, whereas when the reducing valve was cut out, and steam at 5-lbs. pressure was admitted direct from the boiler into the heating main, the percentage of moisture was so great that the steam would not carry it to the far points.

MR. GIFFORD: I have frequently seen the same condition, due to the lifting of water out of the boiler into the mains to such an extent as to cut off the flow of steam to the far points. Water lifting may have been the trouble in the plant referred to by Mr. Hale.

MR. HALE: Before that test was made we put a steam separator on the line and removed, as far as possible, the moisture that was carried up from the boiler with the steam and that did not seem to improve conditions at all.

PROF. HOFFMAN: Was not that steam superheated after it passed through the reducing valve?

MR. HALE: That was exactly the condition.

MR. J. H. DAVIS: There is 25% less fuel used under conditions of reduced steam pressure. When the plant referred to by Mr. Hale was run under a pressure of 5 lbs. the pumps would scarcely handle the water of condensation. They were run by steam from a separate boiler. The boilers were run at 60 lbs. pressure, and after the reducing valve was placed on the heating main one pump was ample to take care of the condensation.

The Amount of Solid Material Extracted by Air Washers

One of the topics discussed at the recent heating engineers' meeting in

Chicago was the amount of solid material, dust and dirt extracted by air-washing apparatus in various cities, say, per 1,000,000 cu. ft. of air treated. Speaking on this topic, Mr. Thomas, of Thomas & Smith, manufacturers of the Acme air washer, said: "With a perfect air washing apparatus we can extract 99% of the solid material from the air. Different localities in the same city will have different quantities of solid matter in the air. I do not think I would care to make an off-hand statement as to the weight of solid matter taken out of the air in different cities. Here in Chicago we are taking out as much as 60 lbs. of solid matter in 72 hours with a 40,000-ft. air washer on a 10-hour run. That is about as close an observation as I have made regarding the actual weight of material extracted. But we have made many tests as to the percentage of solid matter taken out of air by air washers and that will vary anywhere from 95% to 99%, and we have had as good as 99⅗%.

PRESIDENT BOLTON: Do you determine the percentage by analysis of the air?

MR. THOMAS: Yes.

PRESIDENT BOLTON: In Chicago, is the nature of that material a dust or is it carbon?

MR. THOMAS: It is carbon dust and a mixture of other things. In some localities you will find coffee and peanut scale and other matter blown out in the process of preparing foodstuffs and manufactured products. That all gets into the air and finds its way into the ventilating apparatus. But about half of the dirt is carbon.

PRESIDENT BOLTON: Can you remove the smoke from the air within 5%?

MR. THOMAS: No, that cannot be done. We can get within about 20% of all the smoke. In other words, you can get about 70% of the carbon out of the smoke, but no more unless you had a device of prohibitive dimensions and an excessive water supply.

PRESIDENT BOLTON: Can you tell us anything about the elimination of smells with air washers?

MR. THOMAS: There are very few smells that will not be dissipated by an air washer. If the air is overcharged with sulphur, you will get a trace of the sulphur. That can be removed by putting a chemical solution in the machine, using soda ash or something of that kind. Outside of sulphur, there are very few odors that get through. In the stockyards, for instance, when you go into Swift's office building, there is no trace there of the odors in the yards, but as soon as you leave the building the odors are decidedly noticeable.

MR. NATKIN: In the Armour office building, at the stockyards, the air washers, I believe, are of 40,000 cu. ft. capacity, the tank floor containing 40 sq. ft. They removed, in the summer time, 2 in. of dirt from that floor every day with the apparatus running for 12 or 14 hours a day. Odors are almost entirely eliminated. In summer, of course, there is more dirt to be removed than in winter, as we have the dust in the air in addition to the smoke and other particles.

Problems in Connection with Boiler Rating

We present herewith extracts from the discussion of Frank L. Busey's paper on the subject of boiler and furnace ratings which was read at the recent summer meeting of the heating engineers and which appeared in THE HEATING AND VENTILATING MAGAZINE for July:

PROF. ALLEN: In determining his results, I would ask Mr. Busey if he could distinguish between the fire surface and the flue surface of the boilers tested?

MR. BUSEY: No. I took the total heating surface. That would make some difference, although I have not been able to determine just how much. It is very difficult at best to ascertain what the various manufacturers call direct and indirect heating surface. I might measure up a boiler and call some of the surface direct, though the manufacturers might call a little more of it direct. As far as I can determine, basing estimates upon the total

heating surface regardless of the ratio of direct to indirect surface, has not made any serious difference in the results.

PROF. ALLEN: Do you not think there is a marked difference between the fire surface and the fuel surface?

MR. BUSEY: There is, yes, but with any ordinary variation in their ratio the efficiency is not greatly affected.

PROF. ALLEN: I can always distinguish this difference. In a power boiler, the gas is always dynamic and in a heating boiler it is static.

MR. BUSEY: That is true when you put on extra indirect surface and the passes are tortuous and more or less restricted. They soon fill up with soot, choking the draft. This is shown when anthracite coal is burned. In that case, with the addition of more indirect surface, the greater the ratio of heating surface to grate, the greater the effect while, with bituminous, the effects are noticeably less.

PROF. ALLEN: To give your charts universal application, you would have to know the proportions of fire surface and flue surface or else develop a curve for a particular boiler, would you not?

MR. BUSEY: I hardly think so. I have been able to obtain the results of a good many tests, and in plotting them it surprised me to see how close they came to each other, irrespective of how much direct or indirect surface there was and irrespective of the shape of the boilers.

MR. W. M. MACKAY: I think it is quite remarkable that we do get that straight line relation between the ratio of grate surface and heating surface and it seems to me that if it is based on a large number of observations, it practically overcomes the obstacle of the necessity of knowing the relative amounts of fire and flue surfaces.

I believe the basis of rating is relatively unimportant; that is, we do not need to rate a boiler in terms of horsepower, because that, after all, is a definite number of heat units and we can readily translate that into so many square feet of radiation.

MR. W. W. MACON: I notice that according to Mr. Busey's figures that there is a relatively constant efficiency for a considerable range and rate of firing. I do not recall seeing similar tables, but I know that point has been raised, particularly in connection with catalogue ratings, where it is evident that the rating has been a mathematical calculation, that is, a series of ratings has been developed from one particular test. Mr. Busey's curves show that if we do not give ratings for, say, a fuel consumption of less than 4 lbs. of coal per hour per square foot of grate, the error is not large.

MR. BUSEY: I have found that with most boilers the efficiency curve is fairly flat, that is, within 80% to 100% of the boiler's rating, the efficiency is fairly constant. When forcing house-heating boilers 50% to 60% overload, the efficiency begins to drop off rapidly. Then again, I have run them as low as 16% to 18% of their capacity, and the efficiency dropped off to perhaps 20%.

PRESIDENT BOLTON: For several years I have inquired high and low among the large boiler makers for results of tests run below 50% of boilers' rated capacities and have not been able to learn of such records. Inasmuch as a great many boilers, both used for power and for house heating, are operated for a considerable portion of the time very much below their ratings, sometimes even below 50% of their rated capabilities, it becomes important to know what they will do at such low rates of output. Mr. Busey makes the statement that when running boilers as low as 15% of their ratings the efficiency is only about 20%, which is an indication of the inefficiency of many steam heating boilers, because for a large part of the season, in most sections, a comparatively low output is required on the part of the boilers occupied in heating service.

The Importance of Vacuum Cleaning to the Ventilating Engineer

A review of the progress of vacuum cleaning and an estimate of the present and future state of this branch of engineering were brought out at the recent meeting of the heating engineers in a discussion devoted to the topic of the importance of vacuum cleaning to the ventilating engineer. President Bolton stated that it was very interesting to see how the heating profession is reaching out in this direction. Just before leaving New York, Mr. Bolton said he had received the report of an examination of a vacuum cleaning device which comes strictly within the purview of the heating engineer. It is a new device which produces a vacuum by the steam raised, and a gas fire is utilized to dry and burn the dust which is caught by the apparatus. (This device was illustrated in detail in THE HEATING AND VENTILATING MAGAZINE for September, 1911.)

Prof. John R. Allen told of the experiments on vacuum cleaners which had been made in Detroit before purchasing vacuum cleaners for all the schools of that city. Prof. Allen was a member of the commission, and stated that while the report itself was not ready for publication at that time, some things connected with the investigation could be stated. "In the first place," he said, "the vacuum cleaner men do not know yet just what they are doing. Some of the cleaners have given vacua all the way from 7 in. to 15½ in. Vacuum pumps are used in this connection that produce anywhere from 2 to 26 in. of vacuum. The manufacturers seem to have very little knowledge of the vacuum required to do certain work. The weight of the machines required to do the same kind of work varies all the way from 500 to 7000 lbs. So there seems to be no agreement among vacuum cleaning people as to the methods that should be followed in getting results. The methods have not been standardized at all.

"When it comes to cleaning," continued Prof. Allen, "as far as the speed of the cleaning is concerned, the vacuum cleaner can never compete with the broom. We made a test in one schoolroom and allowed all the vacuum cleaner men to clean a room around the seats. The work required from 15 to 26 min. Then we put a janitor in with a broom and he did the same work in between 3½ and 4 min. As far as the work is concerned, it is a little more work for the janitor to sweep with the cleaner than with the broom. Undoubtedly there has been a great advantage in the elimination of dust and the vacuum cleaner recommends itself for introduction in school work for that reason.

PRESIDENT BOLTON: In the department store of R. H. Macy & Co., New York, vacuum cleaners were installed and we were unable to clean the carpets with 8 in. of vacuum. The dust and dirt ground into the carpets on account of the traffic made it necessary to raise the vacuum to 15 in. before the dirt could be raised.

DR. W. F. COLBERT: I might say that vacuum cleaners have proved very satisfactory in modernly constructed hospitals. The present method of schoolroom construction, however, is not adapted to vacuum cleaning. If the hospital method of construction were followed, of having curves instead of corners at the baseboard, and if schoolrooms had washable floors, with the desks set into the floors and the floors rounded up about the desk legs, there would be no room for complaint. But I might say, in that case, there would be no use for vacuum cleaners except for cleaning floor coverings, which would probably be removed from the rooms each day and cleaned in the yard. The walls and floor of a schoolroom properly could be washed down every day.

PROF. ALLEN: I agree with the statement that the question is one regarding the construction of the school. The construction of the modern schoolroom is not to be recommended. A schoolroom should be made so that it could be washed.

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RECENT heavy rainfalls, especially in the vicinity of New York City, have been observed with much interest by heating engineers in view of the recent discussion as to the effect upon the climatic conditions of a great city of the vast quantity of heat emanating from its industries and from the heating of its buildings. It was indicated that this great emission of heat might be capable of producing some effect upon the rainfall, and the records show that New York has experienced a continuous decrease in precipitation during the winter months since 1884. At the same time it was shown that the number of cloudless days has considerably increased. These, it was stated, are indications of a growing dryness which appear to accompany a decrease in the annual precipitation. While this deduction may not in the least be affected by the heavy rains of the last few weeks, especially as they occurred outside of the heating season, nevertheless, it should be noted that the total rainfall for the year 1911 up to the end of September is 27.35 in., as against 25.62 in. for the corresponding period last year. Applying the figures of the remaining months of 1910 to this year's figures to date, the totals would read 41.71 in. for this year as against 39.98 in. for 1910. This will be but 2.92 in. below the normal.

WITH this issue we conclude the publication of Byron T. Gifford's series of articles on the subject of "Central Station Heating." The articles have proved of such wide interest that they will be published in book form, supplemented with a quantity of additional matter that will make the work thoroughly comprehensive. Central station heating has long felt the need of an authoritative treatise covering every phase of the industry, and Mr. Gifford's forthcoming book, therefore, will be the pioneer step to this end.

A COLLECTION of ten formulas, published on another page of this issue, for use in calculating heating requirements, forms a striking illustration of the variety of methods that are used, not only by central station men, from whom the formulas in question were received, but, we dare say, by many other heating engineers. As the formulas stand, however, they are hardly an edifying commentary on the progress made towards standards in heating practice, for their application to a typical problem, it is stated, will give as many solutions as there are formulas. Yet they are interesting because they are the rules that are actually in use to-day by the parties presenting them and are being applied, no doubt, to hundreds of buildings yearly.

Central Station Heating

By Byron T. Gifford

7.—MAINTENANCE

(Previous articles in this series: "Pipe Line Losses from Radiation," April, 1911; "Rates," May, 1911; "'Ready to Serve' or 'Maximum Demand' Rate," June, 1911; "Operation," July, 1911; "Pipe Line Losses from Friction," August, 1911; "Management," September, 1911.)

Maintenance of heating property might be called the care necessary to keep the property in first-class condition. The maintenance of the heating station is very similar to any steam-generating or coal-burning plant. It seems unnecessary to mention the essential points in this connection, but too much can never be said on this point. It is obvious that in any plant the old saying, "a stitch in time saves nine," is very true. Procrastination in this respect is decidedly costly and detrimental to good results.

At the first sign of weakness the weakest part should be replaced or repaired at once. It is often a question whether to repair a weakened part or to replace it with a new one. That can only be decided by experience, but "when in doubt replace it" is a good proverb to remember and to be guided by, especially if the part in question is of any importance in giving uninterrupted service. Every little detail should be carefully watched. If the needed repairs and replacements are allowed to go unheeded the inevitable result will be a breakdown with the cost of repair increased many times.

If a plant is allowed to get dirty it soon develops careless habits among the employees and this, of course, is bad. Keep the floor of the plant swept up and use a little paint now and then. It all helps wonderfully. Cleanliness and neatness will give greater returns per dollar spent than any other little thing that can be done. The manager, superintendent and chief engineer should be cranky on this subject. The details of maintenance of boilers, furnaces, pumps and other machinery are well known and understood and will not be noted here.

The care of the pipe line in a heating system is very important and also comparatively easy. As a general rule it is not a good policy to be looking for trouble, but in pipe-line maintenance it is the opposite—we should be looking for trouble so that the instant anything develops it can be remedied.

Leaks are the worst of all troubles, due to the deteriorating effect they have on the line. A leak of either steam or water causes the pipe to corrode, the covering to deteriorate and the efficiency to decrease. The loss of heat in the leak itself is sufficient to warrant immediate repair, but this loss

coupled with the permanent depreciation of the pipe line makes it all the more important that this deteriorating cause be stopped.

It is not difficult to locate leaks in a pipe-line system. In any system the leak will either show up on the surface of the ground by melting the snow over the line or by causing a wet spot to appear. If the street is paved or for any other reason the dampness cannot get to the surface the condensed steam or hot water will follow the conduit, covering or underdrain to the nearest manhole and can be detected there.

It is at these places that we should be looking for trouble. Oftentimes a leak will make sufficient noise to be heard quite a distance and listening for this noise will often help. It is probably unnecessary to explain how to discover leaks. It requires only a little common sense.

If the piping is made up in place by an experienced pipe-line foreman there is little chance for leaks. Before the pipe line is covered it should be tested or, at least, a test applied before the line is completely covered, so that a leak can be detected easily if there is one. After the line is once tight there is little chance of a leak developing except at the moving parts and these moving parts should be so arranged as to allow frequent and easy inspection. It will be noted that while leaks are very bad, yet the possibility of leaks in the pipe is very remote, but in the moving parts this is different. In these places leaks are apt to develop, and while the effect on the physical condition of the line is not as bad, for the reason that moving parts are usually in a manhole, yet the loss of heat from a leak of this kind makes it imperative that the leak be stopped.

Underdrainage is also important to the life of a pipe-line system if, of course, the line is not laid in a loose soil such as sand or gravel. If it is laid in that kind of soil extreme care should be taken, to be sure that there is no chance for any water to stand around the pipe line, and, if there is the least doubt about it, put in the underdrain. It is necessary to keep the underdrain working and inspection holes should be put in the drains at manholes so that it can be seen that it is operating. Tests should also be made from one manhole to the next to prove that the drain is open. This can be done by pouring water into the drain and seeing it pass the next inspection hole.

If the pipe line is kept dry the efficiency is kept high, but if the line is covered with water the efficiency is reduced many fold and, in addition, the covering is materially effected by being wet or by alternating dry and wet conditions. It is obvious, therefore, that it is essential that the line be perfectly drained.

Traps should be cleaned and inspected regularly. Of course, traps are used only on steam systems. It is necessary to have a by-pass around the traps so that the traps can be taken out and cleaned and not interfere with the operation of the line. If a trap should stop operating it will not cause any serious result, as a rule, but it can cause a water hammer, consequently it is bad policy to allow a trap to stop. They should be inspected at least once a week unless experience has taught that is too often, which the writer thinks will not be so. Traps are usually set in a manhole or in a place that can be entered often and easily.

The traps should be connected with a sewer or some convenient drain for handling the condensation. Cooling coils of some kind should be arranged so as not to cause vapor to rise from the sewer connections to the street.

Meters demand close inspection and, as these instruments are used to measure line condensation, we must consider their care under pipe-line maintenance. It is especially essential to watch the meters to see that they are clean and operating perfectly. Meters should be tested every year and cleaned at least once every year. It is often necessary to clean them oftener, especially on a new installation and, for that reason, a by-pass should be installed around the meters as well as the traps. Between the meter and the trap a telltale pipe should be connected so as to allow inspection to ascertain whether or not the trap is blowing steam.

Always place the meters and traps in as dry a place as possible and place them in such a position that they can be taken out and cleaned without much work. Keep them well painted and free from rust. During the summer months both the meters and the traps should be taken out of the manholes and cleaned, painted and tested. Then when the heating season starts they are in fine shape.

Expansion joints should be watched, but they are such a small care that little need be said about them. Keep the brasses clean and free from foreign matter and keep the packing boxes full and not pulled up too tight. The same can be said of valve stems. Keep them packed well and pulled up just enough to stop any leaks around the stem. It is often advisable to place a shield in the form of a half-circle over the brass sleeve of the expansion joint to protect it from scratches caused by stepping on it in getting in and out of the manhole. These shields do not cost much and are very serviceable.

All cast-iron fittings and all pipes that are not covered and the inside of all manhole covers should be kept well painted with a good quality of iron paint.

Avoid letting any surface water drip through the manhole covers. This can be easily done by casting a trough on the inside of the manhole cover frame to catch this water and pipe

it away to the underdrain or sump in the bottom of the manhole. If the manhole covers are already in place without the trough it can be easily made of heavy galvanized iron and attached to the frame.

As stated before, we should not wait to have troubles show themselves on the surface before attending to them. Dig into the proposition and find out if there is anything wrong.

Pipe-line maintenance is not expensive. It is a very small percentage of the original cost. On a plant with five and one-half (5½) miles of mains and laterals, one man at $75.00 per month and a helper at $60.00 per month can completely overhaul the entire line in thirty days in the summer and one day a week will suffice for inspection and repairs during the heating season. The cost of material for the repairs and maintenance will average about $220.00 per year for five miles or about $40.00 per mile per year. The labor per year amounts to approximately $315.00 or about $57.00 per mile per year. As the average pipe line costs about $25,000.00 per mile, we can see the maintenance is less than one-half of one per cent. per annum of the first cost, which is a decidedly low maintenance cost and a property can be maintained properly for that amount. There is, then, no excuse to offer for not using all diligence in maintaining the pipe line properly. A property well maintained will depreciate in value to a far less extent than if not kept up.

Depreciation and maintenance are closely allied.

This article brings to a close Mr. Gifford's series of papers on Central Station Heating. We are pleased to announce that this matter, together with a quantity of additional data on district heating practice, written and compiled by Mr. Gifford, and covering every phase of the subject, will shortly be published in book form by the Heating and Ventilating Magazine Company. The work will constitute the first comprehensive handbook to be published on Central Station Heating and will embrace not only its engineering features, but will go extensively into the matter of franchises and kindred subjects.

Orders for this work, which will be published shortly, may now be placed with the Heating and Ventilating Magazine Company, 1123 Broadway, New York.

Relative Economy of Intermittent and Continuous Heating

A chance remark made at the recent summer meeting of the heating engineers led to an extended discussion of a subject that was not down on the programme, but which proved one of the liveliest interest to those present. Speaking to the topic of "The Operation and Care of Heating and Ventilating Apparatus," William M. Mackay made the observation that "it takes more coal to raise the temperature in a building than it does to maintain it."

PROF. ALLEN: In regard to the question of the effect of heating at night or allowing a building to become cold at night, this last winter we had an opportunity to experiment with these conditions at the University of Michigan, where we burn about 100 tons of coal a day. We operate a plant of 3000 H. P. and we experimented as to whether it would be more economical to allow the buildings to go cold on Saturday afternoon and reheat it Monday morning or to keep them heated during the entire period. The results showed that it took about one ton more coal to maintain heat in the buildings over Sunday than to allow them to go cold and then reheat them.

N. L. PATTERSON: In connection with the Chicago public schools we have a bulletin calling the engineer's attention to the fact that he will be required to have the buildings in proper condition as to temperature Monday morning. Where severe weather sets in Saturday or Sunday he must visit his building and keep his heating plant in operation. As a rule, however, with modern plants such as we are now using, very few engineers attempt to run the system over Sunday.

MR. WEINSHANK: To sustain Prof. Allen's statement I will add that in designing plants where intermittent heat is to be used, I always find it good practice to increase the radiation about 30%. I also find that additional amount of fuel thus consumed in a season corresponds to the extra amount of radiation put in.

I can cite a case where a Roman Catholic Church and Presbyterian Church were within two blocks of each other. They were both of about the same size and the janitors of the two churches exchanged notes regarding the fuel consumption. In the Presbyterian Church, which was only heated Wednesdays, Saturdays and Sundays, they burned about 25% or 30% more fuel than in the Roman Catholic Church, where the temperature was kept at 70% all the week and 24 hours a day. In designing work, I usually tell the owner that it will be cheaper for him to keep up steam continuously during the heating season than to let the building cool off at intervals. Several look at the statement skeptically but, after a trial, they find it is cheaper for them to keep up steam and give the apparatus the care that it requires.

Any heating apparatus, operated intermittently, also suffers greatly from wear and tear. Steam fitters will tell you that in such cases they are often called upon to replace cracked radiators and bursted sections or leaky tubes of boilers.

Institute of Operating Engineers

Following are the officers elected at the first annual meeting of the institute, held September 1-3, at the Engineering Societies Building, where the institute's headquarters are located:

President, J. C. Jurgensen; vice-president, for one year, Willis Lawrence; vice-president, for two years, W. B. Ennis; vice-president, for three years, J. G. Ould; secretary, H. E. Collins, and treasurer, W. P. F. Hill.

Cash for Back Numbers

Liberal prices will be paid for any or all of the following back numbers of THE HEATING AND VENTILATING MAGAZINE: February, March, August and November, 1905; March, May and December, 1906; January, October and November, 1907; January and August, 1908; January, February and September, 1909; March, September and October, 1910. Address THE HEATING AND VENTILATING MAGAZINE, 1123 Broadway, New York.

Legal Decisions

Plans Must Be In Accordance With Accepted Proposition

In an action for the balance of the contract price for building a schoolhouse it appeared that when the contract was signed, ventilators had not been discussed and it was not known to the contract parties that they would be referred to in the plans. The estimate was made from a picture of the schoolhouse. When the plans were presented to him the plaintiff said he would not build, as they had been changed and handed them back. There was evidence that a trustee then stated that they would leave the ventilators out. The plaintiff thereupon began the work and erected the building without ventilators. After its erection the trustees refused to payment of the balance of the price until the ventilators had been put in. It was held that as the plans and specifications when finally prepared were not in accordance with the proposition which the contractor made and the trustees accepted, the former was not required to put in ventilators unless, after the plans were presented to him, he approved of them and agreed to build upon them.—Smith vs. Russell, 129 N. Y. Supp., 461.

Breach of Warranty of Hot-Air Wood Furnace

In an action for damages for breach of warranty that a hot-air wood furnace would properly heat a dwelling house in which it was erected, evidence for the defendants that they had erected other heating plants with the same kind of furnaces, and that they had all been efficient, and some had satisfactorily heated houses of equal size with the plaintiff's with wood fuel was held inadmissible on the ground that the evidence had no tendency to show that the furnace in question complied with the warranty. The plaintiff's claim was that the furnace was better adapted to coal than wood and would not heat the house with wood, which was what it was agreed that he should burn.—Watkins vs. Phelps, Michigan Supreme Court.

Lien on Property for Price of Steam Heating Plant Installed with Owner's Consent

The defendant was owner of premises leased to a tenant for three years. The tenant employed the plaintiff to install a heating apparatus in the premises, and the work was completed about a month before the tenant left the premises, which was a year before the expiration of the lease. He failed to pay anything for the work, and the action was brought to foreclose a mechanic's lien placed upon the premises, and was instituted against the landlord on the theory that she consented to the improvements and became thereby liable for their cost. The New York lien law provides that contractors and others who perform labor or furnish material for the improvement of real propety with the consent of the owner shall have a lien upon the property. It was clearly established by the evidence that the lease provided in express terms that the tenant should have a steam heating plant installed in the premises, for which he was allowed the sum of $200 per month by way of deduction from the rent. It was also undisputed that the landlord called on the plaintiff and sent him to the tenant to make the contract for the work. The plaintiff thereupon saw the tenant, secured the contract, and performed the work; but his demand for payment from the tenant was refused. On appeal it was held that the case as made out by the plaintiff established a cause of action and judgment dismissing the case was reversed and new trial ordered. The provision in the lease in reference to the work and the act of the landlord in directing it constituted a sufficient consent within the purpose and requirements of the statute.

The case is similar to N. Y. Elevator Supply Co. vs. Bremer, 74 App. Div., 400, 77 N. Y. Supp., 509, where it was held that where a lease contained a covenant by which the lesses agreed to install a steam heating and elevator plant upon the premises at their own expense, the plant to belong to the lessors at the completion of the term; and the lessees entered into a contract for the work with the knowledge of the lessors, the inference was justified that the work was done with the consent of the lessors, rendering the property subject to a mechanic's lien for the cost of the work.—Meistrell vs. Baldwin, New York Appellate Division.

Van Auken Patent Not Anticipated

The Van Auken patent, No. 828,153, for valve mechanism for discharging air and water of condensation from steam heating systems, was not anticipated, although the elements of the combination were all in the prior art in some form, and it discloses invention. While not a pioneer in a broad way, the claims are entitled to a reasonably liberal construction. The first four claims, while broad in terms, must be limited by the specification and drawings to a structure in which the conduit between the radiator and the

float chamber opens into the chamber above the line at which the water of condensation therein lifts the float. As thus limited, the patent is not infringed by the device of the Boegen patent, No. 959,297.

The Canfield and Van Auken patent, No. 890,555, for a discharge valve mechanism for steam radiators, is not infringed by the device of the Boegen patent.—Van Auken vs. Monash-Younker Co., Circuit Court, N. D., Illinois, E. D.

Changes in Street Grades

The Supreme Court of Indiana holds that a light and heating company is not entitled to an award for damage caused its property by a change of the grades of streets made by the city in making an improvement under the track elevation statute of March 3, 1905 (Indiana Acts, 1905, c. 82), thus invalidating an assessment of such damages by the board of public works.—City of Indianapolis vs. Indianapolis Light & Heat Co.

No Rights Under Surety Bond Without Priority of Contract

A board of education contracted with an engineering corporation to install a heating and ventilating equipment in a public school building, and the contractor gave the bond of a surety company. The contractor did not perform the work, but another company subsequently did. Under a contract with this company, the plaintiff in an action against the surety company furnished and installed the covering for the steam pipes which formed part of the heating apparatus. There was no contractual relation between the plaintiff and the first corporation or the board of education. It was held that though the plaintiff furnished the material and installed the covering of the pipes it could not recover against the surety on the bond, because it did not appear that the material was furnished or the labor performed under a contract with, or at the instance of, the original contractors, whose conduct was assured by the surety company or with the board of education. —Board of Education vs. United States Fidelity & Guarantee Co., Missouri.

When Is a Ventilating Apparatus "On Sale" Within the Patent Law?

In an equity action to restrain the infringement of letters patent for improvements in a ventilating apparatus the defendant pleaded in substance that during the pendency of his application, the patentee represented to the Commissioner of Patents that the subject matter of his application, shown in his specification and drawings, had been "in public use and on sale and had been sold in the United States of America more than two years before (the) application was filed" in the Patent Office, March 5, 1908; that the patent was therefore void, because of the Commissioner's error in granting it. There was no public use of the invention, and the question before the court was therefore: Was the invention on sale before March 5, 1906? The phrase of the statute, Rev. Stat., § 4886, is "not in public use or on sale for more than two years prior to his application."

The file wrapper showed that the application was originally rejected by the Patent Office because of a prior disclosure of the invention in certain patents which did not lay claim to it. There was disclosure, but no interference. The file wrapper went on to show that the patentee, in order to meet the effect of the admitted disclosure, and to overcome the action of the Patent Office, filed there, under rule 75, two affidavits for the purpose of carrying back his invention beyond the date of the disclosure.

In interpreting Rev. Stat. § 4886 several things are to be noted: First, the patent fails if the invention is on sale by any person, with or without the patentee's knowledge, consent or approval. It was otherwise under the statute of 1836. Second, the invention may be "on sale" though there is no sale. It was otherwise under the statute of 1839. Third, a single unrestricted sale is sufficient. Fourth, the mere manufacture of the invention does not defeat the patent, nor does the physical non-existence of the article save the patent from the operation of the statute. The court held that the apparatus was "on sale" prior to the period of two years.

A manufacturer who at a given date agrees to the course of business to make, sell and deliver at a later date according to drawings then in existence, apparatus afterwards patented, appeared to the court to have that apparatus on sale at the later date, if not at the earlier.

The complaintant contended that the manufacture and sale should be looked upon as merely experimental, and therefore not within the scope of the statute. There was, however, nothing in the record to show that the apparatus was the first constructed by the complainant. The burden of proving that the use was experimental rested upon the patentee.—McCreery Engineering Co. vs. Massachusetts Fan Co., Massachusetts Circuit Court.

Rates for Heating

Central heating companies at present favor the use of a meter that measures the condensation from the various radiators and pipes throughout the building. For this condensation a price usually about one-tenth of the cost per ton of anthracite is made for each 1000 lbs. of condensation measured, on which basis it is assumed

that the maximum efficiency of an ordinary isolated private heating plant would be an evaporation of 5 lbs. of water per pound of fuel, in which case 1 ton of fuel would produce 10,000 lbs. of steam.—*From report of Committee on Data, National District Heating Association.*

The Use of Temperature Records

A correct record of the outside temperature and wind velocity daily should be kept by each manager. It is astonishing how little accurate observation of temperature conditions prevails among heating plant customers. A few warm days in a winter month will be clearly remembered, the cold ones entirely forgotten, with the consequent impression left that the month was comparatively warm. When the bill for the month's heating is received there is usually a complaint, which the temperature records will prove to be without foundation. Very few customers realize the effect of the outside temperature, and especially the wind velocity, upon the consumption of heat, and many of them have an idea that their bills for the three winter months should be practically uniform, when, as you know, there is often a wide variance in the temperature conditions.—*George W. Wright before the National District Heating Association.*

Ventilating the Pennsylvania Railroad's Tunnel in Baltimore

The Pennsylvania Railroad is installing a large ventilating plant in one of the tunnels under Baltimore. This tunnel is 4,963 ft. long and has a cross sectional area of 432 sq. ft. It was determined that it would require 450,000 cu. ft. of air per minute. This volume will drive a current of air through the tunnel with a velocity of 12 miles per hour, and will give a complete air change in 4¾ minutes.

Immediately over one of the portals is the fan room, the floor of which is 28 ft. above the tracks. In this room are two large electrically driven Sirocco fans, with fan wheels or impellers 12½ ft. in diameter. A division plate divides the breadth of these wheels into two equal sections and air is received from both sides. The air is discharged downward into the tunnel through a nozzle which lies close to the roof. This nozzle is flattened and curved to fit the tunnel arch, so that the air comes out through a slit along the arch extending from the springing line at each side. This draws in air from the portal on the principle of an injector. When a train is moving with the air current, the smoke is driven ahead of the engine; when moving against it, the smoke is blown back over the cab without bothering the engineman.

To discharge the volume of air required and to overcome the friction resistance of the tunnel, the fan wheel must revolve at a speed of 104 R. P. M., which will require about 190 H. P. to drive it. Only one of these fans is intended to be run at a time, the other is held in reserve for use in case of accident.

Charles S. Churchill, chief engineer of the Norfolk & Western, who designed the ventilating plants of the Gallitzin, the Big Bend and the Elkhorn tunnels of the Pennsylvania and the Norfolk & Western, also designed this plant.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE ***on receipt of the stated price.***

AIR CONDITIONING

A Large Fan and Air Conditioning System for a Cotton Mill. L. L. Lewis. Illustrated description of a large fan for supplying air in a New Bedford, Mass., mill. 1000 w. Eng News—Aug. 24, 1911. 20c.

CAR HEATING AND VENTILATING

Heating Cars Containing Perishable Freight. E. F. McPike. Read before the Peoria Div., Am. Assn. of R. R. Supts. Discusses methods, especially the successful use of the charcoal heater. 2500 w. Ry Age Gaz—Aug. 18, 1911. 20c.

Ventilation of Sleeping Cars. Thomas R. Crowder. Abstract of a paper read before the Am. Pub. Health Assn. Also editorial. An investigation of the quality of the air and discussion of the requirements. 4000 w. Ry Age Gaz—Aug. 25, 1911. 20c.

DUST PREVENTION

The Dust Nuisance, Its Evils and Abatement. John S. Brodie. Paper read before the Royal Sanitary Institute. 700 w. Surveyor—Aug. 18, 1911. 40c.

FEED-WATER HEATING

Bleeding Receiver to Heat Feed Water. Gives calculation showing how a saving of 4.74% of the heat in the steam may be saved, theoretically, by using steam from the receiver to raise the feed-water temperature from 100° to 210° F. 1600 w. Power—Aug. 8, 1911. 20c.

VENTILATION

The Cooling and Ventilation of Engine Rooms. Discusses the problems involved and their solutions. 2000 w. Elec Engr, Lond—Aug. 11, 1911. 40c.

VENTILATION, MINE

Reversing the Ventilation. T. A. Southern and H. W. Halbaum. An extended discussion of the reversal of ventilation which is normally either of the exhaustive or of the compressive type. 4600 w. Col Guard—

July 18, 1911. 5300 w. Aug. 4, 1911. 3800 w. (8 figs.) Aug. 18. Each 40c.

A Large Fan and Air Conditioning System for a Cotton Mill. L. L. Lewis. Describes plant having a 20-ft. fan driven by a 125-H.P. engine. 960 w. (1 fig.) Eng News—Aug. 24, 1911. 20c.

HOT AIR HEATING

Unusual Type of Blower Heating System. Illustrated description of gas engine jacket and exhaust utilized to heat water for fan heaters. 1300 w. Met Work—July 14, 1911. 20c.

HOT-WATER HEATING

Hot-Water Heating by Forced Circulation. Ira N. Evans. Describes this system. Diagram. 3000 w. Power—July 18, 1911.

Troubles with Hot Water Piping and Hot Water Supplies in Buildings. George C. Whipple. From a paper read before the American Water Works Association, Rochester, N. Y., June 8, 1911. 8300 w. Eng News—July 13, 1911. 20c.

THEATRES

The Heating and Ventilating of Theaters. Charles L. Hubbard. Illustrates and describes advanced ideas. 3000 w. Br Build—June, 1911. 40c.

A Remarkable Fan Performance

In a recent test of the Cycloidal fan, patented and manufactured by the Garden City Fan Co., Chicago, some remarkable results were obtained. The test was made by a well-known Western firm of architects of a No. 12 Cycloidal blower installed in the First Church of Christ, Scientist, in Winnipeg, Man. In a letter giving the results of the test, the writer states:

We have tested the No. 12 Cycloidal blower which you installed in this building with the following results:

Velocity of fan, 150 R. P. M.

Area of duct at fan discharge, 12¼ sq. ft.

Velocity of air, 2000 ft. per minute.

Volume of air delivered per minute, 24,500 cu. ft.

Air pressure in duct, ⅜ oz.

Electric current consumed, 3 K. W. per hour, equivalent to 4 H. P.

The blower was driven by a 5 H. P. electric motor, with a countershaft intervening to reduce speed. Some belt slippage was observable during the test.

The air was discharged into a trunk duct leading to furnace, then into a distributing duct system supplying the building. The duct system was only partially installed, the fan under test being required to deliver air through a duct system with a reduced capacity than the fan was designed for, and there was considerable back discharge at the intake, giving evidence that the fan had reserve capacity, which it was unable to develop owing to lack of capacity in the duct system. Notwithstanding this belt slippage and reduced duct capacity, the performance of the blower was substantially up to your guarantee, and quite satisfactory to us, in fact, we consider it quite remarkable.

Yours truly,

(Signed) JORDAN & OVER.

The above tests were not factory tests, but, as the letter indicates, were made under operating conditions, and on an installation made hundreds of miles from the factory where they were built.

Delegates to the National Conservation Congress

The following were the representatives of the American Society of Heating and Ventilating Engineers named to attend the Third National Conservation Congress at Kansas City, Mo., September 25-27: J. H. Kinealy, chairman; J. H. Kitchen, B. C. Davis, J. M. Kent and A. H. DeLannay.

The society reports that at a recent meeting of its board of governors, 19 applications for membership were approved.

American Society of Mechanical Engineers

The nominating committee of the American Society of Mechanical Engineers, consisting of R. C. Carpenter, chairman, R. H. Fernald, A. M. Hunt, E. G. Spilsbury and C. J. H. Woodbury, has named the following ticket, to be voted on at the society's forthcoming annual meeting, December 5-8:

President, Alexander C. Humphreys, Hoboken, N. J.; vice-president (for two years), Wm. F. Durand, Stanford, Cal., Ira N. Hollis, Cambridge, Mass., Thos. B. Stearns, Denver, Col.; managers (for three years), Chas. J. Davidson, Milwaukee, Wis., Henry Hess, Philadelphia, Pa., George A. Orrok, New York; treasurer, Wm. H. Wiley, New York.

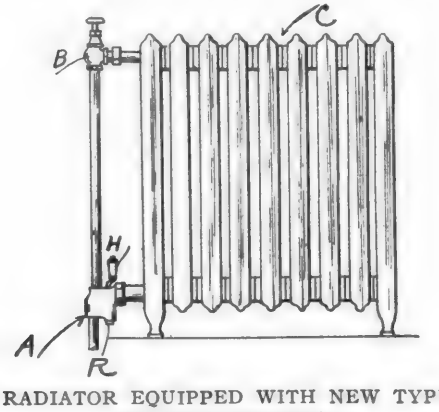
Draper's Self-Recording Thermometer, also Draper's Self-Recording Hygrometer, for measuring the amount of moisture in the atmosphere, are the subjects of two card circulars being sent out to the trade by the Draper Mfg. Co., 152 Front street, New York. The recording thermometer is made in two sizes, with three ranges: 50° below zero to 80° above, 20 below zero to 110° above, 70° to 200° and zero to 260°, depending upon the purpose for which it is intended. The Draper self-recording hygrometer gives a continuous record in ink on a paper chart of the percentage of humidity in the air. The paper chart is actuated by a clock movement and makes one complete revolution in a week. The company also manufactures barometers, rain gauges, wind instruments, anemometers and anemoscopes, both indicating and recording (for measuring direction of wind).

NEW DEVICES

The Wizard Valve Fitting

A new valve fitting, shown herewith, is designed to be used on any one-pipe system of steam heating and, when attached to any radiator in such a system, to convert it into a vacuum-vapor, graduated steam supply apparatus. It is claimed that by use of this device in a one-pipe steam heating system, one-quarter, one-half or all of the radiator surface can be heated, permitting individual control of the radiator to suit the wishes of the occupant or the variations of the weather. It is also found that smaller piping can be used, both in the mains and risers, a ¾-in. graduated or radiator valve being large enough to supply steam to 150 sq. ft. of radiating surface. It is also stated that pipe coils can be operated with this device on a one-pipe system and the steam supply graduated to obtain the desired results. The fitting may be used either with or without air valves. An air valve may be connected at H. The riser connecting with the Wizard fitting is shown at A. B is a graduated supply valve to the radiator C.

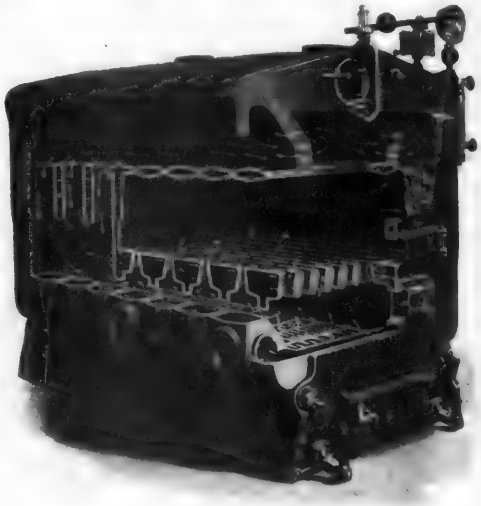
The internal construction of the fitting provides a direct passage through the



RADIATOR EQUIPPED WITH NEW TYPE OF VALVE FITTING

valve fitting from the riser to the graduated valve at the top. A trap in the fitting prevents the steam from short-circuiting into the radiator at the bottom. A ball valve with a suitable seat is provided to form a trap before the trap has filled with condensation. The plug R at the bottom elevates the ball valve to a sufficient height to maintain a water seal or trap in the valve fitting at all times. This valve is the invention of J. J. Wilson, of Philadelphia, a well-known consulting engineer and a charter member of The American Society of Heating and Ventilating Engineers. He has been allowed a patent on the fitting.

Ideal Heating Journal for September, 1911, the new publication of the American Radiator Co., Chicago, is full of hints for the steam fitter as well as for the heating engineer. The *Journal* contains an illustrated description of one of the company's latest products, the Ideal



IDEAL DOWN-DRAFT BOILER FOR USE WITH SOFT COAL

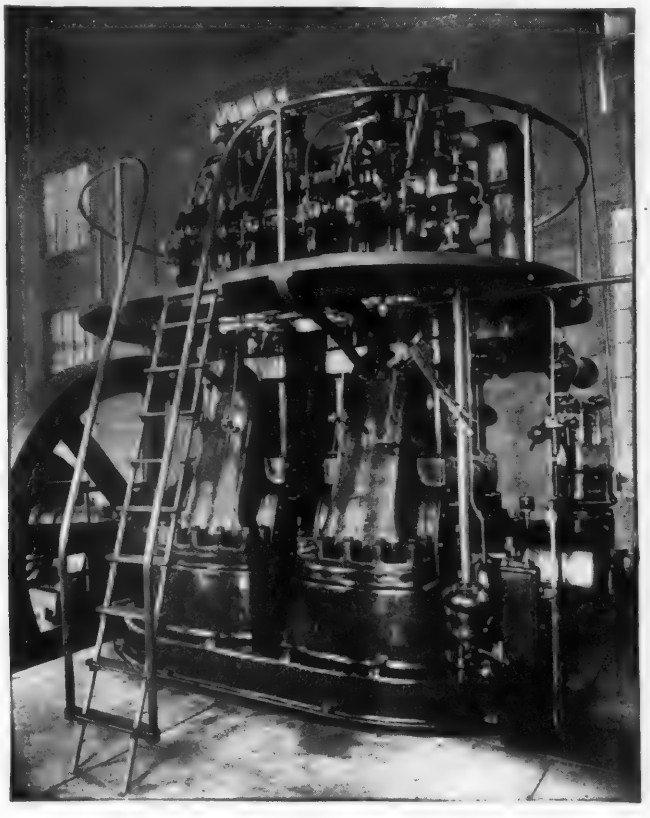
down-draft boiler, which is made exclusively for soft coal. This boiler has been brought out to meet the municipal ordinances of some cities which enforce a certain limit to the time after feeding boilers used in large buildings during which the chimneys may emit smoke. These ordinances usually except residences, but for apartment and other large buildings in charge of a janitor, where the feeding of soft coal is very frequent, this requirement calls for a heating boiler which will burn soft coal and without smoke emission from the chimney. Among the illustrations in the September issue is a typical installation of American Rococo wall radiators in a Turkish bath at San Francisco, the German Emperor's palace at Potsdam, heated with American radiators, the Rayal Automobile Club, London, heated with American direct and indirect radiators and the Bankers Trust Company building, New York, also heated with American radiators and Vento heaters. An article on Rococo wall radiation vs. pipe coils contains some interesting points on the advantages of wall radiation.

Handy Valve Wheel for radiator valves, gauge cocks, air valves, gas logs, etc., is a unique improvement in valve construction patented and manufactured by J. O'Meara, Inc., 103 Walker street,

New York. The handle may be supplied in any selected wood to match the trim of the room. It has no top or bottom plates, nuts or screws and has a door knob finish that prevents burning the hand in opening or closing the valve.

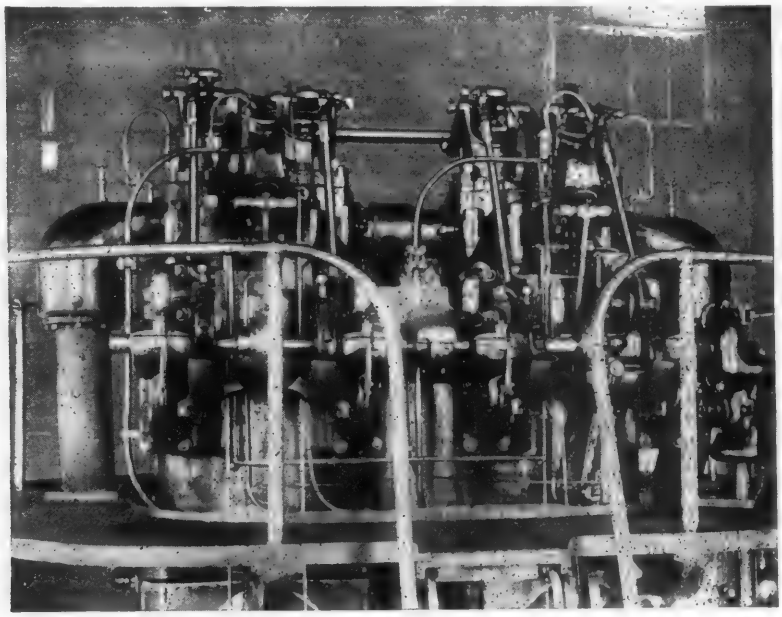
Trade Literature

Atlas Crude-Oil Engines (Diesel Type), built in two, three and four cylinder vertical units, respectively, 300, 450 and 600 B. H. P., is a catalogue of unusual interest, published by the Atlas Engine Works, Indianapolis, Ind. Special emphasis is laid on the economy of this type of engine which, it is stated, is capable of producing 1 B. H. P. hour on less than ½ lb. of fuel oil, making $1.35 per 10-hour day for 100 B. H. P., or $2.00 per day for 100 K. W. Comparisons are given showing the relative fuel costs for a steam engine versus an Atlas oil engine with a percentage of saving in favor of the oil engine approximating 80% for each size of unit. Under other headings are treated the comparative costs of power producer gas versus Atlas oil engine, individual plants versus central station service, endurance and economy tests (with tables and chart), mechanical efficiency and economy on light loads, to which is added a detailed description of the design and construction of the Atlas oil engine, illustrated with many photographs Special attention is called to the fact that the Atlas oil engine is not an explosive engine, the air being first drawn into the cylinder, then heated by compression, after whch a fine spray of oil is gradually and steadily injected into the cylinder, while the compressed air is expanding at constant pressure. Combustion, therefore, is gradual, the pressure and temperature in the cylinder never rising appreciably above that due to the compression of air to about 500 lbs. on the first upward stroke. The impulse, therefore, is taken on and relieved gradually so that the engine operates without shock. The temperature necessary for ignition is obtained solely by compression of atmospheric air alone. Pp. 36. Sixe 8x10½ in.



NEW TYPE OF ATLAS CRUDE-OIL ENGINE

Advantages Derived by Positively Freeing Drying Apparatus of Water of Condensation are explained by Mr. C. Hill-Smith, industrial engineer, in a pamphlet published by Warren Webster & Co., Camden, N. J. This deals with the vacuum system as applied to dryers, with special reference to the drying of paper. As compared with the usual method of discharging condensation by gravity, the vacuum system operates with greater difference in pressure between the dryers and the return header, promoting a rapid and positive flow, increasing the efficiency by keeping the dryers free from water. The vacuum valve allows the water and air to be removed from the dryers, but holds back the steam, thus conserving valuable heat and enabling the paper to be dried with less steam or the machine run at higher speeds. In addition to producing difference in pressure, the vacuum pump provides a means of getting the condensation into a tank or heater located within the return header.



VIEW ABOVE GALLERY, ATLAS CRUDE-OIL ENGINE

United States Boilers, Capitol Sectional Improved Type, is the title of a new catalogue from the United States Radiator Corporation, Detroit, Mich., calling attention in detail to the construction features of this type of heater, which include countersunk headers, long flue travel, extensive heating surface, thin waterways, slip nipple connections, divided sections, large flues, deep firepot, double shakers and convenient shaking apparatus. These points are taken up in order with views of the various parts. Special emphasis is laid on the adherence to the divided section idea on the ground of greater durability through allowing for expansion and contraction. The divided sections also serve to prevent complete disablement as it is a matter of one-half hour's time to unfasten the bolts of a broken section and plug the nipple openings. The catalogue includes figures for roughing-in measurements and has price lists for three complete series of both steam and hot water boilers. Pp. 32. Size 3½x6 in. (standard).

Triton Packless Water Valve

Interesting features of the Triton packless water valve, which is manufactured by the United States Radiator Corporation, Detroit, Mich., include the following:

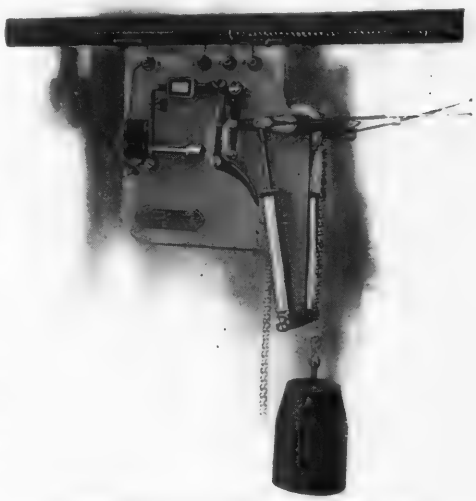
Handle of well-seasoned wood, with a dead black, durable finish. Indicator plate on top to show whether valve is open or shut. Handle holder made substantially of steam metal, and extending down within the inner casing of the bonnet as far as upper washer. Bonnet of one piece with body, extending up under the handle holder, thus protecting the entire working apparatus from external injury. Spring specially tempered and rustless, holding both of the composition washers under firm tension above and below the flange in the bonnet. Stem cast

in one piece with the movable shell, simplifying and strengthening the internal construction of valve, and preventing the detachment of the shell.

Packless Washers, twin washers, giving double protection. Made of a special non-deteriorating composition, and held tightly by the spring, preventing leakage at the stem even under heavy pressure. Movable shell heavily cast, with full size opening. Moves on two points of contact, top and bottom, preventing corrosion and sticking. Opens with half turn. Body made entirely of new metal. Tail piece machined for ball joint, with full-length threads. Union nut with a heavy rim to withstand excessive strain.

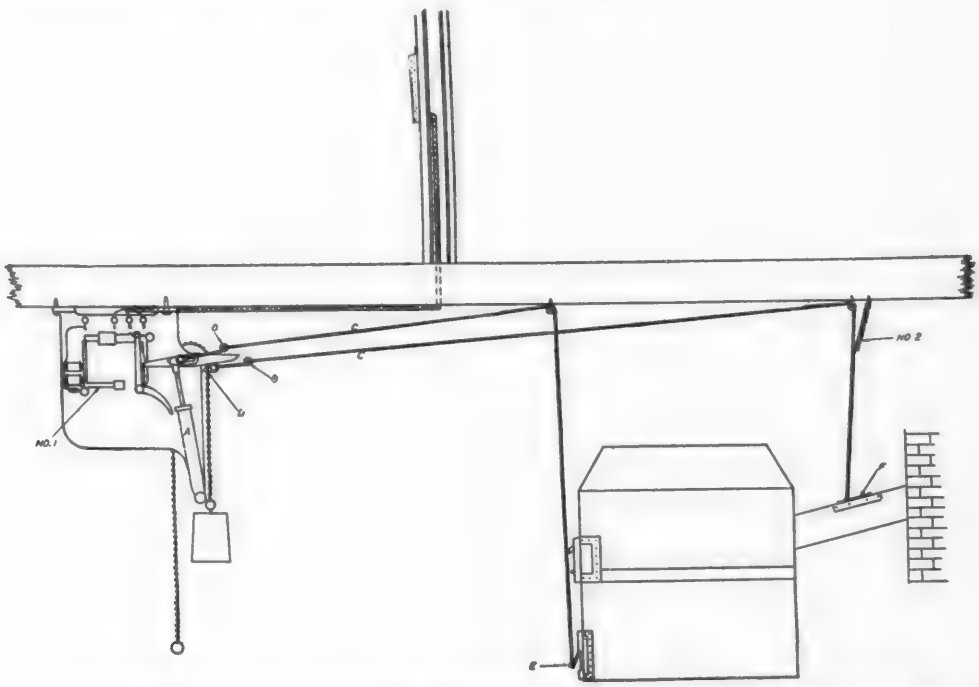
The valve is made in six sizes, from ½ in. to 2 in. and has rough body, plated all over.

Automatic Comfort is the title of a newly-issued circular describing the Crandon Automatic Damper Regulator, made by the Crandon Mfg. Co., Bellows Falls, Vt. The device is styled "the janitor that never sleeps." The device is adapted for regulating the dampers of a hot air, hot water or steam heater and is controlled by a thermostat operated by a weight. The thermostat, placed in one of the rooms of a house, is set at the point at which the desired temperature is to be maintained and operates to open or close the dampers as the temperature falls or rises above this point. The motor, which is fastened with screws to the ceiling of the cellar, is connected by an electric wire with the thermostat in the rooms above. The revolving crank arms of the motor are connected by chains and wires over two pulleys, screwed to



CRANDALL AUTOMATIC DAMPER REGULATOR

the cellar ceiling, with both the draft door and the check draft. To keep the mechanism in operation, the user pulls up the chain bearing the weight once a day. The device is made of aluminum, bronze and brass. Size of circular, 3½ x 6¼ in. pp. 16.



TYPICAL INSTALLATION OF THE CRANDALL AUTOMATIC DAMPER REGULATOR

The SPARKS SYSTEM

THE Successful Contractor is always alert to the interests of his trade. The Architect and Owner are continually looking for appliances that will improve their heating plants and effect a saving in labor and fuel.

We have it. *The Sparks System costs nothing* to maintain. Operates *below atmosphere.* Reduces fuel consumption.

With the Sparks System you are enabled to circulate steam throughout the entire heating system, including the boiler, at a pressure less than that of the atmosphere and thereby effect a saving of from 15% to 25%.

It is a recognized fact by the engineering profession of the 20th Century that all heating plants should be equipped with a vacuum system that will actually *produce results without increasing the cost of maintenance* and operation. This demand has become so great that we have in the past year tripled our business.

Why? Because we have the *only apparatus* in use today that will effect a saving and *produce results without the aid of outside power.*

The Sparks System can be applied to existing heating plants as easily as to new ones, regardless of size or character.

Our proposition to steamfitters is most attractive.

No royalties. Absolute protection guaranteed.

Write for Our New Catalogue

IROQUOIS ENGINEERING CO.

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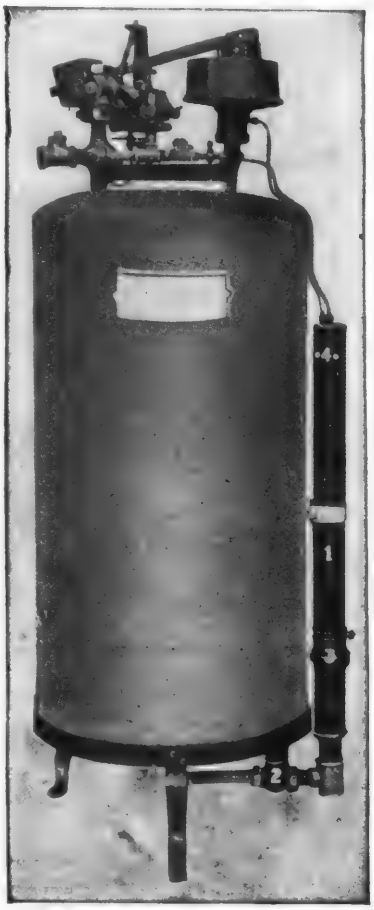

The Automatic Vacuum Pump

AUTOMATIC VACUUM PUMP CO., Manufacturers and Patentees Chicago and St. Louis

Watson-Stillman Twinvolute Turbine Pumps are the subject of a noteworthy catalogue, issued by the Watson-Stillman Co., New York. The catalogue is especially useful through the presentation of characteristic curves of different-sized pumps operating under varying conditions. The catalogue is handsomely prepared, with many details and other illustrations from photographs and contains, in addition, much miscellaneous matter connected with the subject of turbines. Size 6 x 9 in. (standard). Pp. 56.

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WHAT OUR READERS THINK OF US

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E. P. SCALES

Allen-Scales Engineering Co.

624 STAHLMAN BUILDING

NASHVILLE, TENN.

SOUTHERN REPRESENTATIVES
D. G. C. VALVE CO.
NEW YORK CITY

POWER PLANT
HEATING SYSTEMS
GENERAL ENGINEERING

Heating and Ventilating Magazine Co.

1123 Broadway,

New York City.

Gentlemen:

Enclosed find check for $ 1.00, with which renew the subscription of W. H. Allen, changing the subscription to this company.

We want to congratuate you on the magazine which you are getting out, and the class of articles which have been appearing in it. We would not be without the magazine for three time the amount of the subscription.

Wishing you a most prosperous New Year, we remain,

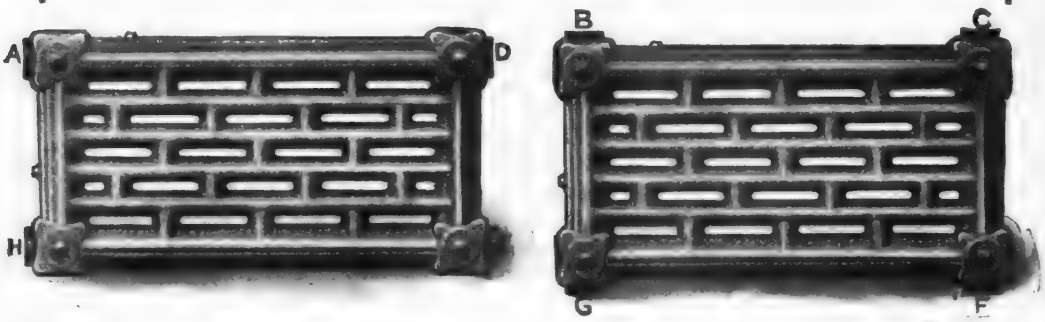
Very truly yours,

WHA-H

ALLEN-SCALES ENGINEERING CO.

W. Harwell Allen

Out Of The Way Radiators



¶ There is an ever-increasing demand for radiators that can be hung off the floor on wall or ceiling, placed in skylights, and still be practical, efficient heating surfaces.

¶ No radiator made adapts itself better to space-saving conditions than the ATHENIAN WALL PATTERN of United States Radiators. Used in factory buildings where space is most valuable, in churches and schools, under windows to stop cold air currents, in assembly halls, stores, garages and all buildings where radiation should be off the floor.

¶ The ATHENIAN WALL PATTERN is a most efficient wall radiator. Made in three sizes, connected with extra heavy right and left hand inside nipples. Has cross-bar circulation which increases its heating value, giving more efficiency than can be had in any other pattern of wall radiator.

¶ Assembled in all shapes at the factory which saves labor cost on the job and they can easily be used in odd corners and out of the way places where regular radiation would be impossible.

¶ It seems to us that you must be interested in this modern space-saving radiator, and we have prepared for your benefit a booklet that illustrates and describes in full the special advantages of this OUT OF THE WAY RADIATOR. It's free—Write for it to-day.

UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES. DETROIT, MICH.

BRANCHES IN PRINCIPAL CITIES

Makers of More Styles of Radiation Than Any Other Individual Manufacturer

TRADE AND MISCELLANEOUS NOTES

Coming Event

December 5-8, 1911.—Annual meeting of the American Society of Mechanical Engineers, New York. Headquarters at the Engineering Societies Building.

Miscellaneous Notes

Midland Furnace Club held its regular quarterly meeting at the La Salle Hotel, Chicago September 26.

Anderson, Ind.—Because the franchise of the Home Heating Company's steam heating plant requires that steam heat service for the central section of the city begin on Oceober 1 the Anderson Trust Company, which recently acquired the plant at the receiver's sale, has given notice that it will put the plant into operation. C. W. Hooven, who controls the Anderson Gas Company, has made an offer of $6,000 for the steam heating plant, but the trust company demands $10,000 for the property.

Kalamazoo, Mich.—W. H. Schott, of Chicago, has presented to the city council of Kalamazoo a proposed ordinance for the establishment of a central heating plant, together with a proposed franchise in his favor to lay a system of steam pipes through the streets for heating or other purposes. The proposed franchise stipulates that the plant shall be in operation by October 15, 1912. The city is to be compensated for the use of its streets after 1917 by payment of 1% of the gross earnings until 1920, when 2% of the gross earnings shall be paid until 1925. From 1925 on during the life of the franchise the city is to receive 3% of the company's gross earnings. The franchise is to run for 30 years and the rate of service on the meter basis is 75 cents per 1,000 lbs. of steam for the first 10,000 lbs. per month, decreasing at a rate of 5 cents per 1,000 lbs. for each 10,000 lbs. per month consumed.

Lebanon, Ind.—The Lebanon Heating Co. will be sold at a receiver's sale for the benefit of stockholders and creditors. The plant was built at a cost of $103,000, and supplies heat to over 200 homes in Lebanon.

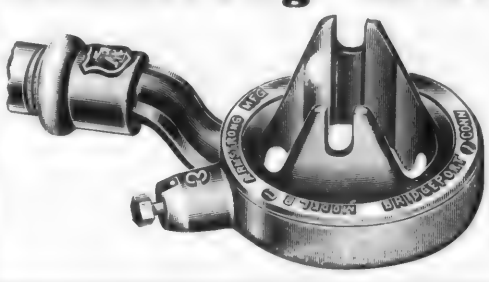
New Bedford, Mass.—As a result of a misunderstanding of the specifications for the heating and ventilating flues for the new high school building at that place, it is probable that the city council will find it necessary to make an additional appropriation for the construction of the flues. The question at issue is whether the flues were to be of plaster or steel, because if built of plaster, the work would come under the general building contract. The designing engineer has testified that in his specifications he intended that plaster flues should be used while Howard & Sons, the general contractors, declare that the specifications do not contain any clause instructing them to build flues of any sort in the building.

American Institute of Chemical Engineers will hold its fourth annual meeting in Washington, D. C., December 20-22, 1911. Among the papers to be presented will be one on the general subject of patents.

Robert E. Hall has resigned his position as assistant manager of Francis Bros. & Jelett, Philadelphia, Pa., to become vice-president and treasurer of the Goulds Mfg. Co., of New England, Boston, Mass.

W. H. Smead, formerly engineer of the heating and power piping department of the General Fire Extinguisher Co., Cleve-

Armstrong Ratchet Attachment



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321 Knowlton St., Bridgeport, Conn.

CATALOG MAILED ON REQUEST

land, O., has been appointed superintendent of the heating and equipment department of The Samuel Austin & Son Co., Cleveland, O., building contractors.

Engineering News, one of the oldest journals in the country devoted to civil, mechanical, mining and electrical engineering, founded by George H. Frost, and published weekly by The Engineering News Publishing Co., 220 Broadway, New York, has been sold to the Hill Publishing Co., of New York, publishers of the *American Machinist, Power* and *The Engineering and Mining Journal.* The purchase price is said to be in the neighborhood of $1,000,000. The editorial policy and management of *Engineering News* will remain the same as heretofore.

Building operations for August from 99 cities show a total of $70,083,293, which is an increase of 24.2% over the corresponding period of 1910. These figures, however, are not as favorable as they appear on account of the fact that the large total credited to Chicago, amounting to $26,200,500, is due to the filing of a number of permits to take advantage of the regulation regarding the heights of new structures, since abrogated by a new law. If the Chicago totals are excluded it is found that the construction permitted for in August aggregated $43,882,793, a decrease of 10.5% from July and 11.6% from August a year ago. The figures for Chicago were 288.7% above the same period last year. The figures for some of the principal other cities were: New York, $8,606,860, decrease 21%; Pittsburg, $1,138,531, decrease 16%; Portland, Ore., decrease 32.1%; San Francisco, $2,139,095, increase 45.3%; St. Louis, $1,631,579, decrease 29.5%; Cincinnati, $1,302,985, increase 120.6%; Cleveland, $1,486,618, decrease 1.3%; Detroit, $1,668,875, decrease 33.1%; Milwaukee, $1,036,196, increase 8.2%; Minneapolis, $1,042,800, decrease 24%.

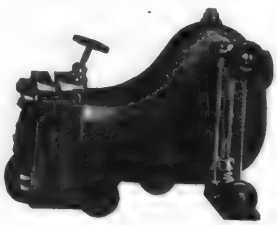
New York Chapter of the American Society of Heating and Ventilating Engineers may be formed as the result of a meeting held October 10 at the society's headquarters.

Trade Literature

Facts About the Isolated Plant, No. 2, has just been issued by the National Isolated Power Plant Association, New York. It is a 16-page folder calling attention to the work of the association which covers investigations of the relative economy of the isolated plant and central station service both generally and in particular instances. The association has a committee whose special duty it is to investigate and make an unbiased report upon all cases brought to its attention. Thus if an owner is about to construct a new building and is not sufficiently versed in engineering matters to decide whether an isolated plant or central station service is more economical, a member of the association's committee is sent to call upon him and give him the benefit of his expert service. The movement is designed to offset the activities of the central station advocates who, it is claimed, do not always give owners a fair idea of the efficiency to be obtained of the isolated plant when properly operated, with the result that there has been an alarming increase in the num-

BETTER THAN LEAD Dixon's Pipe Joint Compound is better and cheaper than red or white lead.
Doesn't "set" joints—goes farther.
JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.

McDaniel Improved Steam Trap
WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.
160 North 7th Street • PHILADELPHIA, PA.
Send for Catalogue

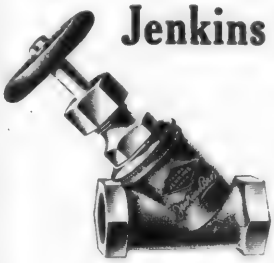
ber of buildings using central station service.

A special supplement accompanies the folder stating that after going to press it has been learned that following a long legal battle, the Longacre Electric Light & Power Co. has been granted a franchise to operate in New York City, and has received permission to issue bonds to the amount of $50,000,000. This franchise carries with it the privilege of using the present street conduits for its cables. The company intends to build one or more power houses within the city, but realizing that there are many isolated plants operating considerably under their rated capacities, the Longacre Company, it is stated, has offered to purchase this excess current from the smaller plants at 1½c. per K. W. hour during the daytime and at 1¼c. during the night. This will permit the smaller plants to be run at 100% load all the time. Heretofore, the New York Edison Company has had a monopoly of central station service in New York.

Reilly Multicoil Evaporators, made by the Griscom-Spencer Co., 90 West street, New York, intended for producing pure water by distillation from sea water or impure natural water, are described and illustrated in a new catalogue, showing their use for ocean steamships, power plants, ice plants, breweries, factories, hotels, office buildings, hospitals and chemical laboratories. The exclusive features of construction of the Reilly multicoil evaporators are used of heating surface composed of coils of seamless copper tube wound to a small radius and secured to headers by ground union joints, and the provision of a large door opening into the shell, through which the coils can be reached when desired. Multiple effect evaporation is secured by combinations of the evaporators and counter current coolers in series. Pp. 12. Size 6x9 in. (standard).

Disc and Propeller Fans, Steel Plate Exhausters and Volume Blowers and Exhausters are the titles of three new bulletins issued by the National Blower Works, Milwaukee, Wis., which will be found useful to heating engineers. The various types of each fan are reproduced from photographs, with compactly arranged price lists and dimensions. In the case of the steel-plate exhausters for planing mill service the price lists and dimensions are supplemented with photographic views of the various parts, together with capacity tables for each size from 30-in. to 90-in. fans operating under pressures ranging from 2 oz. to 7½ oz. Pp., respectively, 4, 16 and 8. Size of each bulletin, 6x9 in. (standard).

Graphite for September, published by the Joseph Dixon Crucible Co., Jersey

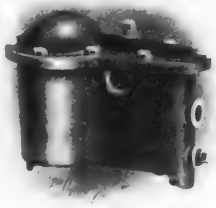


Jenkins Bros. Y or Blow-off Valves

are especially adapted for use where the unobstructed flow of thick fluids is required. As blow-off valves they have no superior. Having a full opening nearly in line with the pipe, but little resistance is offered to the free flow of steam or fluids. Have Jenkins Discs, removable seat rings, and interchangeable parts throughout. Made in Brass or Iron body.

WRITE FOR ILLUSTRATED CATALOGUE

JENKINS BROS., New York, Boston, Philadelphia, Chicago



The Empire Low Pressure Steam Trap

Means Trap Satisfaction

The trap question will be settled if you install an EMPIRE. Adapted to all classes of low pressure work. Perfectly automatic in operation. THE SIMPLEST TRAP MADE. Let us send you one on trial. You will be surprised at its low cost too.

ASK FOR BULLETIN 101

AMERICAN DISTRICT STEAM COMPANY

LOCKPORT, N Y. CHICAGO, ILL.

City, N. J., features the company's Philadelphia district with a double-page group of photographs of the Philadelphia sales force. Among its contents is an interesting article on the "National One-Cent Letter Postage Association." Hundreds of business men, it states, have joined the association, which has its headquarters in Cleveland. Charles William Burrows is the president and George T. McIntosh, secretary-treasurer. During the month of May, 1911, an investigation in the way of sorting, counting and weighing all the mails was made by the Post-Office Department and these records will be tabulated and the results placed before the postal commission. After this commission reports, legislation will be introduced in Congress bearing upon the various features of the postal question, including the movement for one-cent letter postage. Every concern in the United States is eligible to membership. The headquarters of the association are at 506 Chamber of Commerce, Cleveland, O.

Modulation System of Steam Heating in the Sumner Apartments, Newton Centre, Mass., is another publication in the interesting series being published by Warren Webster & Co., Camden, N. J., devoted to illustrated descriptions of typical heating layouts. Basement and typical floor plans are shown, also an isometric view of a typical piping arrangement. Pp. 8. Size 6 x 9 in. (standard).

Steam Turbine Centrifugal Pumps and Other Centrifugal Machinery is the title of a 32-page booklet issued by the DeLaval Steam Turbine Co., of Trenton, N. J., illustrating and describing briefly the several lines of machinery manufactured by that concern, including single stage turbines for driving machinery of all kinds and for rope and belt transmission; turbine-driven centrifugal pumps for water works, for general water service in industrial plants and for boiler feeding, hydraulic pressure work, etc.; velocity staged turbines without gears for direct connection to high-pressure blowers, centrifugal pumps, etc.; multi-stage impulse turbines with gears for driving large direct-current generators, fans, centrifugal pumps and other moderate or low-speed machinery; multi-stage impulse turbines without gears in large sizes for direct connection to high-speed alternators; motor and belt-driven centrifugal pumps for all services and heads; multi-stage centrifugal air compressors and DeLaval speed reduction gears for various services. Copies of this booklet will be sent upon request to those interested.

Scientific Lubrication of Machinery is the title of an attractive 48-page booklet issued by the Richardson Phenix Co. This book gives a detailed description of

THE VALVE THAT WORKS

89 Mowell Automatic Relief Valves are installed in the Doherty Silk Mill, in Paterson, one of the most up-to-date plants in the country and THE SYSTEM WORKS PERFECTLY

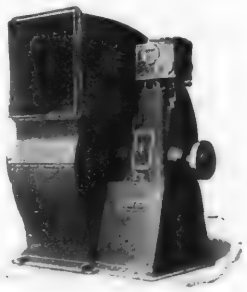
Send for descriptive matter, telling how the Mowell Automatic Relief Valve is suited to Exhaust and Low Pressure Steam Heating, how it expels all air and water from the radiator and how easy it is to keep clean.

Augustus Mowell
249 Graham Avenue, PATERSON, N. J.

Richardson Phenix individual oiling and filtering systems and their many types of oil filters, mechanical lubricators, oil and water separators, sight feed and gang oilers, union-cinch pipe fittings and sight flow indicators, etc. It also contains an interesting discussion on the need and economy of good lubrication and has several pages devoted to the nature and choice of oils, giving simple means by which they may be tested. The information regarding the qualifications of various kinds of oils for different kinds of service should be of value to engineers. This book is one of the most complete treatises that has come to our notice on power plant lubrication and is well worth reading, as it shows how highly this branch of engineering has been perfected for modern power plants.

Monthly Peat Reports, Vol. 1, No. 1, September, 1911, is described as a souvenir and presentation number to commemorate the organization of the Peat Association of Canada. This journal is to be published monthly by the Peat Association of Canada and distributed free for the benefit of all who are interested in the development of Canada's peat resources. The initial issue reviews some of the well-known processes for manufacturing peat and contains news items of the industry in Canada and the United States, as well as in other countries. The Monthly Peat Reports is published from Drawer 2263, Main Post Office, Montreal, Canada.

The Engineering Equipment of Buildings is a handsomely gotten up catalogue just issued by Francis Bros. & Jellett, Inc., Philadelphia and New York, engineers for the design and erection of complete steam power, mechanical, electrical, hydraulic and sanitary equipments of buildings. The publication is quite out of the ordinary, especially as coming from a firm of consulting and contracting engineers. It is issued for the benefit of architects and owners and includes well-executed views of representative buildings in which Francis Bros. & Jellett have either designed or constructed, and in some cases have both designed and erected all or part of the power equipment, mechanical, electrical and fire protection systems. In the 22 years since this company was organized, it states that it has designed or erected work exceeding in cost $14,000,000. Special attention is called to the firm's practice of doing work on the percentage basis which has proved eminently fair to all parties. The catalogue includes a notable array of references and the views of buildings which the company has recently equipped include the Everett Building, New York; Spring Garden Building, Philadelphia; New Dormitory



The
Sturtevant
Multivane Fan

The most efficient commercial Fan in the world.

Occupies less space than any other type and can be built to run at the highest speed.

It is carefully designed and rigidly constructed.

Our Engineers will make recommendations to meet specifications or suggest the best method of installation.

B. F. STURTEVANT CO.
HYDE PARK, MASS.

Ask for Catalog 180 V. 831 Offices in principal cities

Building, Hill School, Pottstown, Pa.; Packard Motor Car Building, New York; Brewster & Co.'s plant, Long Island City; Yale & Towne Mfg. Co.'s plant, Stamford, Conn.; C. C. Knight Co.'s Building, Pittsburg; and a group of Philadelphia buildings all in the same neighborhood, including the Pennsylvania Building, Morris Building, New Girard Trust Co. Building, and the West End Trust Co. Building. Pp. 32. Size 9x12½ in.

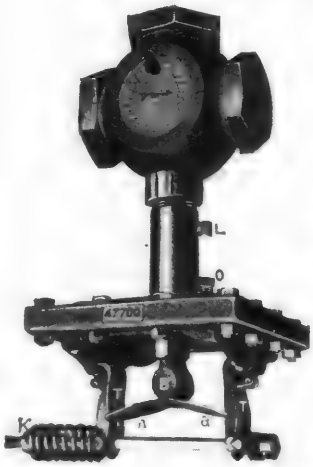
Manufacturers' Notes

Pullman Consolidated Ventilator Co., York, Pa., has been organized, being a merger of the Pullman Automatic Ventilator Co., York, Pa., the Consolidated Ventilating Co., of Rochester, N. Y., and the National Ventilating Co., of New York, all manufacturers of automatic ventilators. The new company is capitalized at $800,000, of which $250,000 is 7% preferred stock. The following officers were elected: President, Freeman C. Allen, Rochester, N. Y.; vice-president, M. D. Kleinzahler, Youngstown, O.; secretary, C. C. Frick, York, Pa.; treasurer and general manager, E. G. Andrews, Rochester, N. Y. These with the following constitute the board of directors: Henry S. Rich, Marietta, Burlew Hill, Rochester, N. Y., P. E. Tucker, Rochester, N. Y., and R. Brace, Trenton, N. J. The machinery of the various plants will be brought to York, where all the manufacturing will be done. The company will employ 100 persons. The company will have an initial working capital of $35,000. With the exception of the Pullman, all of the merged companies are owned outright by the new company, the Consolidated Company being represented in the organization at a valuation of $100,000 and the National Ventilating Company at $25,000. The Kleinzahler syndicate, which secured control of the Pullman Company, secured $133,000 common and $220,000 of the preferred stock of the company and paid off $60,000 in indebtedness. This they turned into the Consolidated Company, receiving in exchange $160,000 in preferred stock.

United States Radiator Corporation, Detroit, Mich., has opened an office in Cincinnati, O., in charge of Harold Q. Porter. The company has appointed C. C. Johnson as manager of its Pittsburg branch in place of F. M. Mechling, who has resigned.

Isaac A. Sheppard & Co., Philadelphia, manufacturers of furnaces and stoves, has sold its plant in Philadelphia to the John B. Stetson Co., hat manufacturers. The change will become effective July 1, 1912. Isaac A. Sheppard & Co. have another plant in Baltimore. It has not been announced what quarters the Philadelphia plant will occupy.

PRESSURE REGULATORS FOR STEAM HEATING



Foster Classes "Q" and "QH"

For Delivery Pressure 1—15 Pounds

A very sensitive and reliable regulator for purposes designed. It is a high grade low pressure regulator. Superior to other makes in construction and workmanship. Has no weights or close fitting pistons and is easily adjusted to pressure desired between zero and 15 pounds.

Made in sizes ¾-inch to 12 inch. Smaller sizes 2-inch and under, are fitted with brass bodies; larger sizes have iron bodies, composition mounted and composition *renewable seats.*

Send for circulars, giving details of operation, etc.

Would you like to have a copy of our new Catalogue when completed?

Foster Engineering Co., Newark, N. J.

American Radiator Co., Chicago, is pushing work on its new warehouse at Bayonne, N. J. The company is arranging to keep a stock on hand of 2,500,000 sq. ft. of radiation and several thousand boilers.

Continental Radiator & Foundry Co., St. Louis, Mo., has completed plans to build a new radiator plant with a capacity of 3,000,000 sq. ft. of radiation a year.

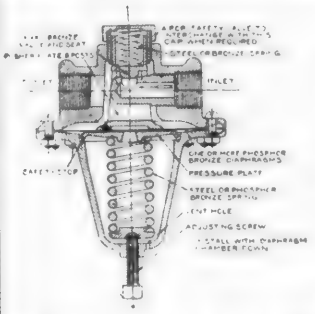
Williams Tool Co., Erie, Pa., will build a fireproof factory building 65 x 125 ft., adjoining the company's present plant and doubling its output. The new building will be ready by January 1, 1912.

American Radiator Co., Chicago, reports the manufacture of the largest radiator ever turned out at its Decatur, Ill., plant. The radiator was made for a job in Wilmette, Ill., and consists of 89 loops. It is 19½ ft. high and weighs about one ton.

Triumph Valve Co., Mansfield, O., is the new name of the Safety Cylinder Valve Co., manufacturers of the Automatic safety cylinder valves, Triumph packless radiator valves and other specialties. The company announces that this is a change in name only, the officers and company remaining the same as heretofore. The officers are: President, Frank Schreidt; vice-president and treasurer, B. J. Balliett; secretary and general manager, Charles E. Schreidt.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., were among the prominent exhibitors at the recent New York State Fair, held in Syracuse. Other exhibitors of heating goods were the Albany Foundry Co., furnaces and ranges; Sill Stove Works, Rochester; Kelsey Heating Co., Syracuse; Fuller & Warren Co., Troy; the Syracuse Heater Co., and the Syracuse Stove Works.

Beler Water Heater Co., Pittsburg, Pa., manufacturer of automatic instantaneous water heaters, has been reorganized by the election of new officers and directors as follows: President, James Hay; vice-president, John Ellis; secretary and treasurer, W. J. Langenheim; directors: Adolph Beler and Edward Schreiner. The new president, James Hay, was until recently president of the Ruud Mfg. Co., Pittsburg, while Mr. Ellis, the vice-president, was superintendent of the Ruud Mfg. Co.'s factory for several years. W. J. Langenheim was formerly secretary and treasurer of the Ruud Co. The capital stock of the new company will be increased to $250,000. The company will eventually occupy the large factory building at 29th and Smallman streets, Pittsburg, owned by Mr. Hay.



Mueller Reducing and Regulating Valves

For Water, Steam, Air, Oil, Gas, Etc.

Single Seat Type, 13,160

This valve is for pressure reduction and regulation in the following kinds of service:

WATER—Cold or hot water in hotels, apartment houses, residences, factories, drinking fountains, breweries, power plants, etc

STEAM—Radiators, small heating systems, small vulcanizers, small bleaching keirs, jacketted kettles, dryers, dyeing tanks, steam heating of trains, forced draft blowers, fan engine regulators for boilers, etc

AIR———Pneumatic tools, oil burners, pneumatic water lifts, ballast tanks, torpedo discharge tubes, etc.

OIL———Fuel oil, pressure lubricating systems, etc.

GAS——Carbonic acid gas in soda fountains, breweries, water carbonating and bottling establishments, etc. Special valves for oxygen, acetylene, manufactured or natural gas.

Standard stock valves will be assembled for initial pressures up to 250 pounds and for such delivery pressure as specified from atmosphere to 150 pounds.

When writing please specify initial and delivery pressure and service.

H. MUELLER MFG. CO.

DECATUR, ILL., West Cerro Gordo Street NEW YORK, 234 Canal Street

New Firms and Business Changes

H. G. Smith Co., Inc., 150 Nassau street, New York, is a new firm of consulting, heating and ventilating engineers composed of Alfred A. Driggs, formerly of the New York branch of the Pierce, Butler & Pierce Mfg. Co., and Howard G. Smith.

New Incorporations

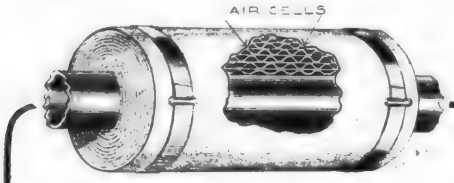
Jepson Bros. Co., Cleveland, O., capital $45,000, to conduct heating, plumbing and gas-fitting business. Incorporators: James E. Sayne, Peter G. Jepson, Anna D. Jepson, Richard J. Jepson and Minnie A. Jepson.

Mailhus & Co., New Orleans, La., capital $10,000. President, Joseph L. Gautreaux; vice-president, Joseph Mailhus.

Larsen & Wood Co., Toledo, O., capital $10,000, to conduct a heating and plumbing business. Incorporators: Neils S. Larsen, James A. Wood, William J. Fritsche, Mark Winchester and William L. Billingslea.

Frush Plumbing Co., Waterloo, Ia., capital $25,000, to conduct a heating and plumbing business. Incorporators: George H. Frush, Jr., William J. Cosgrove, G. D. Bertram and Stephen Mullany.

Northwestern Heating and Plumbing Co., Evanston, Ill., capital $5,000. In-



J-M Asbestocel Pipe Covering is Fireproof

Being made of asbestos **J-M Asbestocel Pipe Covering** does away with the danger of fire from overheated pipes.

It is the most efficient covering for hot water, hot air and low pressure steam heating systems, because it is built on the principle of the arch with the air cells running around the pipes, instead of from end to end, which construction confines the greatest amount of dead air. Will pay for itself in fuel saved in 8½ months.

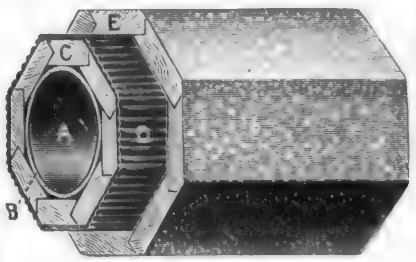
Cannot crack, break or lose its insulating value from rough handling or vibration.

Write Nearest Branch for Sample and Booklet

H. W. Johns-Manville Co.

Baltimore	Kansas City	Philadelphia
Boston	Los Angeles	Pittsburg
Chicago	Milwaukee	San Francisco
Cleveland	Minneapolis	Seattle
Dallas	New Orleans	St. Louis
Detroit	New York	(872)

Wyckoff's



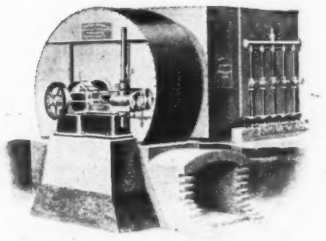
A—Tin Lining
B—Asbestos
C—Wood
D—Corrugated Paper
E—Wood
F—Asphaltum Coating

A Patent Steam Pipe Covering Of More Than Ordinary Quality

Note particularly the construction. First a tin lining, then a layer of asbestos, then a lagging of wood over which comes two coats of corrugated paper, another layer of wood and a coat of asphaltum. Rather a discouraging combination for heat to escape through.

The most absolutely non-conductive, waterproof covering on the market. Send for a copy of the Wyckoff Red Book—it contains complete details.

A. Wyckoff & Son Co.
ELMIRA, NEW YORK



Buffalo Apparatus for Mill and Factory

Ventilation is the better part of Heating

¶ Recognition of this truth has made the fan system of heating and ventilating compulsory in schools almost everywhere. That it applies with equal force to factories, mills and shops is proven by the numerous installations of the

Buffalo Fan System of Heating and Ventilating

¶ Ventilation has in many of these been considered of equal importance to heat distribution on account of its close and undeniable relation to health and efficiency of the human machine at work, rest or play.

¶ You will be interested in our treatise No. 197K. Sent free on request.

BUFFALO FORGE CO.

BUFFALO, N. Y.

New York	St. Louis	Chicago
Pittsburg	Cincinnati	Charlotte
Philadelphia	Los Angeles	Montreal

corporators: Charles S. Wallace, George A. Kearney and E. Major.

Manufacturers' Sales Co., Columbus, O., capital $15,000, to act as sales agents for heating and plumbing and railroad supplies. Incorporators: Harry B. Mingis, B. J. Corbett, W. R. Jones, Harvard B. Gotch and Val. Lower.

Schellhammer & Co., Warren, Pa., incorporated to take over the plumbing and steam heating business of Schellhammer & Co. The company is planning an extension of its business.

William P. Morgan Co., Ridgewood, N. J., capital $25,000, to conduct a heating and plumbing contracting business. Incorporators: William P. Morgan and A. Morgan, Ridgewood; and James W. Dwyer, Paterson.

Kelley Hardware Co., Farmington, Ia., capital $20,000, to take over business conducted in the same name and established in 1905. A heating and plumbing contracting department will be added. Incorporators: O. E. Ostru and R. P. Beer.

Excelovalve Co., 25 West 42nd street, New York, capital $500,000, to manufacture flushing valves and water-saving devices. President, E. D. Barrett; vice-president, W. D. Cushman; treasurer, C. I. Wood; secretary, S. Hartman; assistant secretary, L. Steinfeld.

American Smokeless Furnace Co., Portland, Me., capital $500,000. President, Clarence E. Eaton; treasurer, T. L. Croteau; secretary, James E. Mantell, Portland.

Daniel E. Walsh Co., Boston, to deal in heating apparatus. Incorporators: Daniel E. Walsh, William A. Walsh and George L. Ellsworth.

New Process Heating & Lighting Co., Laporte, Ind., capital $50,000, to manufacture a new heating and lighting invention.

Edward S. Bradley Co., Manchester, Mass., capital $20,000, to conduct a heating and plumbing business. Incorporators: E. S. Bradley, A. J. Hollings and William H. Allen.

Mosley Plumbing and Heating Co., Wilmington, Del., capital $25,000, to conduct a contracting business in heating and plumbing.

Self-Lighting Orchard Heating Co., Denver, Colo., capital $250,000. Incorporators: Oliver M. Farrand, Henry D. Demont and S. G. McMullin.

Contracts Awarded

Schultz & Seibel, Hannibal, O., steam heating Star Theatre in that city.

Moline Heating and Construction Co., Moline, Ill., heating and plumbing new Ridgeway School building at Moline. The heating contract amounts to $7,631 and the plumbing to $4,787.74.

Arthur B. Mueller Co., Kansas Ciey, Mo., heating Norman Ward School for $5,179. Edmunds & Lovett got the plumbing contract at $1,850.

Neville Kellner & Co., Louisville, Ky., heating Parkland School for $1,852.

Capital Building and Construction Co., Springfield, Ill., heating poor farm at Buffalo, Ill., for $4,711.42.

R. Haas Co., Springfield, Ill., heating poor farm at Buffalo, Ill., for $1,935. The boilers will be located in a separate building which will be built by the Capital Building & Construction Co., of Springfield, at its bid of $4,711.42.

Schulteis Bros., San Diego, Cal., heating and plumbing new county jail at that place for $16,500.

F. F. MacNichol & Co., Oshkosh, Wis., heating and ventilating Shawano County Insane Asylum building for $13,000; also heating and ventilating Outagamie County Court House and the Waupaca high school.

J. J. Hurley & Co., Boston, boiler installation for the Hyde School at their bid of $2,292.

Kohlert & Harter, Aurora, Ill., steam heating Irwin building, including the opera house, for $2,000. 4,400 sq. ft. of radiation will be installed.

Buffalo Forge Co., Buffalo, N. Y., heating and ventilating system in the new carpenter shop of the Westinghouse Air Brake Co., at Wilmerding, Pa. The building will be of brick construction and 210 ft. long.

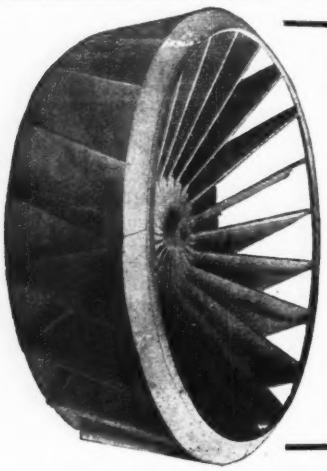
John W. Danforth Co., Buffalo, N. Y., mechanical equipment of the Mare Island Navy Yard, San Francisco, Cal., at its bid of about $105,000. The power house will be one of the largest maintained by the department. The work is to be finished within nine months.

Kenison Bros., Dallas, Tex., steam heating the court house building at Denton, Tex., for $2,331.

Fitzpatrick & Hoepfner, Columbus, O., heating and ventilating new high school building at Canton, O.

C. W. Nelson, Neenah, Wis., central heating plant in the Sherry Building. The plant will supply heat to four stores, an office building, the post office and office in the post office building.

Downey Heating Co., Milwaukee, Wis., heating plant for the State Hospital at Mendota for $8,774.



Not a Bird Cage, a Squirrel Cage, a Rat Trap or a Skyrocket—but—

A Cycloidal Fan or Blower

for all purposes. The only radical improvement in fans in forty years. Takes up less room, runs at slower speed, requires less power, noiseless in operation.

We guarantee our Cycloidals to equal in capacity any fan built—**We bar none**—with from 20 to 25 per cent. less speed and power. We build them in all sizes to suit all conditions—hundreds of them in use—not "as good—but better."

GARDEN CITY FAN CO.
Patentees and Sole Manufacturers
1532 McCORMICK BUILDING CHICAGO
Established 1879
Send for Catalogs 110 and 120, just issued

IMPORTANT NOTICE

Stationary Engineers' Book and Directory (Combined)

For Business—1911 EDITION—Brings Business

Now only time published, get copy at once, only a few left. It contains descriptive contents of 25,000 steam and electric power plants, with the names of 50,000 engineers in following 14 states: Connecticut, Delaware, Iowa, Indiana, Kentucky, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Wisconsin and miscellaneous. Has the best illustrated and latest engineering technical features of instructions by expert writers, and is most valuable to *Engineers* and *Manufacturers* for business use.

800 pages, 9x12, cloth bound. Price, $10.00. Cash with order, 10% discount. Send orders to

G G. McDUFF, Agent, 622 Tribune Bldg., New York City

ILG

PROPELLER FANS ARE BEST BY TEST

SPECIFIED BY ARCHITECTS EVERYWHERE FOR RESTAURANT AND THEATRE VENTILATION, ETC.

CHEAPEST TO INSTALL
CHEAPEST TO OPERATE
CHEAPEST TO MAINTAIN

WRITE FOR BULLETIN No. 5

ILG ELECTRIC VENTILATING CO.

158 WHITING ST., CHICAGO

F. F. MacNichol & Co., Oshkosh, Wis., heating new Orville Beach Memorial Manual Training School, for $7,449; the plumbing contract went to the Toner Plumbing & Heating Co., at its bid of $4,774.

Downey Heating Co., Milwaukee, Wis., heating addition to the North Division High School in Milwaukee for $5,547; also heating the addition to the South Division High School for $6,641. The plumbing for the North Division school went to S. V. Hanley at 2,765 and, for the South Division school, to William Esser at $1,653.

J. Oscar Smith, Moberly, Mo., heating Virginia Building at Columbus, Mo., for $4,000. The Moline vacuum-vapor heating system will be installed.

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